SYMBOLAE BOTANICAE UPSALIENSES VI:1
ARBETEN FRÅN BOTANISKA INSTITUTIONERNA I UPPSALA
UTGIVNA AV PROF. E. MELIN OCH PROF. J. A. NANNFELDT

THE FRESHWATER FLORIDEAE OF SWEDEN

STUDIES ON THEIR TAXONOMY, ECOLOGY, AND DISTRIBUTION

BY

GUNNAR ISRAELSON

UPPSALA
A.-B. LUNDEQUISTSKA BOKHANDELN
(I DISTRIBUTION)

SYMBOLAE BOTANICAE UPSALIENSES

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Preface.

The present paper has been worked out at the Botanical Institute (Institute for Systematic Botany) of the University of Uppsala, and has resulted from investigations which began in 1932 and, with longer or shorter intervals, have been going on up to now.

At the outset I wish to take the opportunity of expressing my gratitude to all those who in one way or another have supported my work.

In doing so it is my pleasant duty first and foremost to address my thanks to my esteemed teacher, Professor Dr. N. Svedelius, former Director of the Institute, who aroused my interest for the freshwater Florideae, and from the very commencement of the investigations has promoted my work in a sympathetic and indefatigable manner. I am also deeply grateful to Professor Dr. J. A. Nannfeldt, the present Director, who most generously placed his time and extensive experience at my disposal during the preparation of the paper for publication.

To my other teachers in botany and especially to Professor Dr. G. E. Du Rietz, Professor Dr. E. Melin, and Professor Dr. R. Sernander, I convey my very sincere thanks for their valuable and stimulating lectures and for their kindly advice.

During the first years of my investigations my interest in the taxonomy of the Batrachospermaceae was greatly stimulated by long letters from Professor Dr. H. Skuja, Riga. I thank him most heartily.

Several persons have contributed valuable collections of algae. Among them I am especially indebted to Dr. G. Lohammar, who placed very extensive and interesting material at my disposal.

To all my friends and colleagues at the Institute I convey my cordial thanks for their kind aid and for fruitful discussions.

The extensive journeys which were necessary to my work would not have been possible without the pecuniary assistance granted by the Royal Swedish Academy of Science, the University of Uppsala, and the Uppsala Students Natural History Society (including its Botanical Section); to all these institutions I am much indebted.

In the matter of linguistic revision I must thank Dr. and Mrs. A. H. King, Lund (for the English), and Fil. lic. N. Hylander, Uppsala (for the Latin diagnoses).

Uppsala, September 1942.

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Introduction.

The recent advances of limnology, particularly the development of the theories of lake- and water-types, have stimulated several Swedish botanists to undertake extensive investigations on the ecology and distribution of water-plants. The resulting works by Samuelsson, Almquist, Lohammar and others have furnished valuable contributions to the characterization of the existent water-types and to the distribution of fresh water regions from the biological point of view.

All the works have this in common: that they deal almost exclusively with vascular plants, which for practical reasons is easily accounted for. The technical facilities connected with the determination, the abundance of records in the literature and in public and private herbaria, and last but not least the relative stability of the taxonomy, make the higher water-plants an ideal subject, especially for more extensive orientations in this sphere.

On the other hand, as the cases are comparatively few where higher water-plants are exclusively restricted to the surrounding water for their nutrition, whereas this must be the rule among lower water-plants like the algae, it might be supposed that the latter will on the whole constitute still better indicators of different types of water and let the limits of regions appear still more sharply than do the former.

The conditions for making researches analogous to the above-mentioned, but with algae as objects, are, however, unfortunately far less favourable. Compared with the higher water-plants the freshwater algae are in all respects little known. Extensive lists of species and valuable special investigations have certainly been published in numerous parts of the globe. The resulting distribution areas are, however, in the vast majority of cases fairly vague, and records of the ecology of the species often appear contradictory. Moreover, because of the unstable taxonomy in most groups, and the consequently varying conceptions of species of different authors, many, especially older, records are of doubtful value. Control specimens are rarely met with, as herbarizing has not been very popular among phycologists and, it must be admitted, in some cases at least would probably have been of very little use. Moreover, the vials containing material in liquids and deposited in public herbaria often show a marked tendency to dry up.

When, about ten years ago, I made up my mind to start studies on the ecology and distribution of freshwater algae in Sweden, it therefore appeared clear from the outset that a compilation of the already existing records would not lead far, but that a large number of new facts had to be brought together. A comparatively narrow limitation of the extent of the researches was necessary in several respects. A territory was chosen which was expected to be suitable for a demonstration of the influence of climatic as well as trophical environmental factors. For further accounts of this district, which is in the following briefly called »Middle Sweden» the reader is referred to p. 71.

Further, a treatment of the entire algaflora was unthinkable. Among the numerous types of algal habitats existing I fixed my choice upon the lotic environments of the running waters, which, from both theoretical and practical points of view, seemed to be well fitted for an investigation of the intended type. By the continued movement of the water-bodies in brooks and rivers a relative uniformity in certain environmental factors such as the chemistry is effected, which might be supposed to result in more differentiated distribution features in the flowing than in the stagnant biotopes, where local or occasional differences, difficult to control, often tend to break the regional unit. Moreover, the running waters afford the advantage that a fairly good view of the vegetation of a section is generally easily obtained without too much sacrifice of time, apart, of course, from the periods of high water and from the central parts of the falls and rapids of the really big rivers, but those are in the minority.

Finally, the preliminary investigations were concentrated mainly upon one group of algae which develops a special richness in forms and is of common occurrence in the flowing waters, viz. the Florideae.

Since then the original plan has been extended both regarding the areas and the alga-groups taken into consideration. Because of the extensiveness of the material collected a division has proved necessary.

Maps of the distribution of two freshwater Phaeophyceae have already been published (Israelson 1938 b) and in this paper the Florideae are treated.

Besides in Middle Sweden, which must be regarded as fairly uniformly investigated, journeys have also been undertaken in the northernmost as well as the southern parts of the country for the purpose of comparison. Though there are still considerable gaps in our knowledge of the occurrence of the algae in question, as several provinces, especially in central Norrland, have so far hardly been visited by phycologists, I think that the present material will be sufficient to give a rather reliable view of the outlines of the Swedish distribution of most species.

As already mentioned, it was originally intended to lay the main stress upon ecological and distributional questions. The work has, however, afforded more taxonomical problems than was expected at the outset and a revision of the group has proved necessary.

The paper has therefore been divided into two parts, the first of which deals with the taxonomical units. In the second part the ecology and distribution of these are treated. Special interest has been devoted to the relations between the water chemistry and the algaflora. For the chemical side of the investigation, the data have been collected almost exclusively from the comparatively extensive material published by Eriksson (1929) and Lohammar (1938).

PART 1.

Taxonomy.

The Chantransioids.

The genus *Chantransia* has developed a great multiplicity of forms in the sea, and a considerable number of marine species has been described. But also in freshwater there are frequently found some Florideae showing a more or less complete morphological conformity to the marine *Chantransiae*. Those forms will subsequently be comprised under the name Chantransioids.

These forms were mostly interpreted by the older authors as belonging to the same genus as the marine ones, and Kützing, Lemmermann, Hansgirg and others distinguished rather many freshwater species of *Chantransia*. Investigations by Thwaites, Wartmann and Sirodot, however, showed that some Chantransioids under certain conditions developed aberrant shoots growing out into typical *Lemanea*-bristles. Between these forms and *Lemanea* there was an organic relation, and the former were apparently to be understood merely as stages of the latter.

An analogous relation between freshwater Chantransioids and species of another genus of Florideae, viz. *Batrachospermum*, was discovered by Sirodot (1873). In his monograph on *Batrachospermum* he gave a very detailed account of his observations. Similar relations to some other freshwater genera of red algae were also pointed out by other authors. After these discoveries a marked inclination to disallow the independence of all Chantransioids grew more and more common among phycologists. It is, however, worthy of remark that Murray and Barton (1891) described a freshwater form with antheridia and carpogonia which they called *Chantransia Boweri*. The establishment of sexual organs of reproduction must be said to constitute strong evidence of the independence of this species.

Brand also reacted against the above-mentioned tendency. In a comprehensive work (1909) he gave a critical survey of the species described up till then, most of which were rejected and regarded as

mere synonyms. Brand divides the Chantransioids into two groups distinguishable also morphologically:

1. *Chantransia*, comprising the independent species, and
2. *Pseudochantransia* (»genus artificiale»), including chantransioid stages of other Florideae.

Although Brand, as it seems, provided very acceptable fundamentals for the knowledge of these interesting freshwater algae, even in later literature a certain hesitancy is to be noted (cf. Pascher 1925). Some authors still seem not to be quite convinced of the existence of independent species. Recently, however, by her investigations on the life cycle of *Rhodochorton violaceum* (= *Chantransia Boweri*) Drew has put the independence of this species beyond doubt.

Although the interpretation of Brand is correct in principle there still remain many questions to be answered before the chantransioid problem including the taxonomy and relations to other Florideae of the Chantransioids is solved. In the following we are to discuss some of them.

If we first consider the clearly independent forms, the freshwater species of the genus *Chantransia*, these must be said to be very similar to several of their marine relatives. They are easily distinguished from the *Pseudochantransiae* by their bright red colour when in sound condition, as also by their more pronouncedly monopodial and regular mode of branching. The monosporangia are mostly very numerous, and the branchlets bearing them are more regularly distributed along extensive portions of the thallus.

The second group of freshwater Chantransioids, the *Pseudochantransiae* of Brand, has as already mentioned proved in several cases to consist of stages of other Florideae, species of the genera *Lemanea*, *Batrachospermum*, *Sirodotia* and in foreign countries yet others. Often the analogy with the protonemal stages of the mosses has been emphasized; the *Pseudochantransiae* are, however, characterized by far higher persistence. They are usually separated from *Chantransia* without any difficulty by the colour of the living specimens, which is rather variable but never bright red; as also by the ramification's being seldom pronouncedly monopodial and on the whole rather sparse and irregular. Monosporangia are entirely lacking or, if present, either sparse or very irregularly distributed.

However, the organic connections with other Florideae of all those forms which were somewhat schematically comprised by Brand under the designation *Pseudochantransia,* can by no means be regarded as established. It is, on the contrary, very likely that some of them are

not juvenile stages of other genera but constitute independent species. It deserves to be remembered that Chantransioids have been found growing at considerable depths in lakes, whereas the sexual plants of *Batrachospermum* seem to be restricted to very shallow water. This problem will be further discussed in the chapter on *Pseudochantransia*.

Regarding nomenclature the literature presents a good deal of confusion. Most authors still use the generic name of *Chantransia* all through for the Chantransioids of the group *Pseudochantransia* in Brand's sense. Certainly these are in various respects rather unclear; one thing, however, seems to be established: they have nothing to do with *Chantransia*. The method proposed by Budde (1933) therefore hardly means an advance (i. e. *Chantransia arcuata* for the chantransioid stages of *Batrachospermum arcuatum*). Designations of the type *B. arcuatum* status chantransioides seem preferable. As already mentioned it is at present unfortunately not very often possible to identify Chantransioids as stages of particular species of other Florideae. In the great majority of cases we are therefore still obliged to work with provisional denominations, and there seems to be no reason, at present, to reject the system of Brand. The generic name of *Pseudochantransia* will therefore be retained in the following though in a somewhat different sense from that of Brand. In my opinion it comprises partly forms which are more or less certain stages of *Batrachospermum*-species or perhaps yet other Florideae, though the specific identity is not established; partly also forms which are probably independent species. According as the forms in question are systematized they should be removed; the former as »stati» of other Florideae, whereas the latter should be assigned to one or perhaps more new genera.

Fam. **Chantransiaceae.**

Chantransia (DC.) Schmitz.

Brand (1909) distinguishes two European species which he characterizes in the following manner:

Ch. violacea: Filis 5—10 μ crassis, intra vitam distincte violaceis vel rufis, saepius ad Lemaneam epiphytica nec non aliis corporibus insidens.

Ch. Hermanni: Filis 7—12 μ crassis, extremis semper cuspidatis, haud raro piliferis, intra vitam pallide purpureo-roseis vel fuscenscentibus.

It may already be emphasized at the outset that keeping the two species apart presents serious difficulties. The diameter of the cells is almost the same in both cases and transgrediately variable. The colour of

living specimens of *Chantransia* is, as far as I have found in Sweden where both types occur, always distinctly red; and the gradations seem, partly at least, to depend upon the degree of light exposure. In shady places the plants are deeper red; in the case of very strong exposure to the sunlight they are often slightly brownish, sometimes very pale. Because of the very minute differences and the difficulties of giving them an adequate expression in words, the colour had in this case better be left out of discussion. The remaining distinctive feature, which has probably played the predominant part in practice, viz. the acuminate ends of the branchlets often provided with long hyaline hairs distinguishing *Ch. Hermanni*, seems to be of more relative validity, to judge from KÜTZING's original figure (1855 Tab. 44, fig. II b) of *Ch. violacea*. This picture shows a form with partly acuminate terminal cells, in some parts even running out into short, hair-like structures. BRAND, moreover, seems to be inclined to regard *Ch. Boweri* as a synonym of *Ch. violacea*, and according to the original diagnosis the former species has long hairs, though not especially abundant. Sometimes forms are met with which at first seem to be devoid of hairs, but after some searching prove to possess some well-developed ones. Thus the hairs are not restricted to *Ch. Hermanni*, and distinguishing species merely by the frequency and length of the hairs seems in this case to be but slightly profitable. BUDDE (1933) regards *Ch. Hermanni* as a »Wuchsform» of *Ch. violacea*. To this no other objection will be made but that according to the rules of priority the name should be *Ch. Hermanni*.

As already mentioned, both types occur in Sweden. The fact is of interest that the hairy and the hairless forms largely show different distribution areas. The former are found mainly in the oligotrophic waters deriving from upland districts on different levels, the latter in lowland rivers rich in nutritive substances. This seems at first to support the hypothesis of two different species strongly. However, as the presence of hairs does not seem to be correlated with any other distinguishing marks, except that the richly hairy forms have sometimes on an average slightly broader cells than the hairless ones, neither morphological nor ecological, other possibilities of explaining the differences should first be sought for.

After the establishment by MURRAY and BARTON of sexual reproduction in *Ch. Boweri* in Scotland, and still more after DREW's discovery of a complete seasonal alternation of generations in her *Rhodochorton violaceum*, the taxonomical problem shifted ground. For up to now sexual reproduction among the freshwater *Chantransiae* has never been observed except in Great Britain. DREW (1937) arrives at the conclusion

that *Ch. Boweri* and her form are identical both with one another and with KÜTZING's *Ch. violacea*. She unites the genera *Chantransia* and *Rhodochorton*, retaining the latter name, and consequently calls her *Chantransia Rhodochorton violaceum*. SKUJA (1938 b p. 613) admits that the sexually reproducing forms from the British Isles undoubtedly belong to one and the same species, but he is not convinced of its identity with the *Ch. violacea* found only with monosporangia from the Continent and other parts of the world.

As to the latter it will, however, appear that the negative reports are due merely to oversight, as sexual stages occur in Sweden too, though they are by no means frequently met with. In all essentials their conformity with the British forms seems to be complete, though somewhat larger measurements of the diameter of the vegetative cells as well as the monosporangia and carposporangia have been obtained. Tetrasporangia-bearing plants have only very rarely been observed, but this is probably due to the fact that collections have been made only exceptionally in winter, when the tetrasporangia-generation, according to DREW, is most frequently found.

Sexual plants have been found exclusively epiphytically on *Lemanea* and should be sought for where *Chantransia* covers the bristles in quantities as a coherent carpeting. As DREW (cf. 1935 and 1937) found, the relative quantities of the sexual specimens vary very much. It seems that they are generally in the minority and that female specimens are often far less frequent than male. Sometimes merely male plants have been found. On one occasion (River Bäljaneån northwest of Klippan in Skåne, 8 July 1941), however, a *Chantransia*-material was collected which appeared to consist mainly of sexual plants. This material is of especial interest from another point of view too. According to DREW *Chantransia* is dioecious, though »in exceptional cases an antheridial branchlet may develop on a carpogonial plant». This is confirmed by most Swedish observations; but in Rössjöholmsån also more clearly bisexual specimens were obtained. These plants bore several well-developed cystocarps and plenty of antheridia together with some monosporangia.

Finally it should be emphasized that sexual specimens have been observed both in the hairless forms, corresponding to *Ch. violacea*, and in more hairy ones preferably referable to *Ch. Hermanni*. No fundamental differences as to the organs of reproduction have been discovered, this being further evidence in favour of the opinion that these species should be united.

In the old moot question regarding the valid generic name I find it suitable, at present, to agree with most of the Swedish phycologists working on marine members of the genus. As the conclusion to be drawn from the present material evidently is that all the forms in consideration belong to one and the same species, these are consequently subsequently referred to as *Ch. Hermanni* (Roth) Desv.

1. *Chantransia Hermanni* (Roth) Desv.

Journ. de Bot., 2, p. 310 (1809); Kütz., Tab. phyc. 5, tab. 43 fig. 2, a—c (1855).

Syn.: *Conferva Hermanni* Roth, Cat. bot., p. 164 (1801); *Trentepohlia pulchella* Ag., Syst., p. 37 (1824); *Ch. violacea* Kütz., Phyc. germ. p. 285 (1845); Tab. phyc. 5, tab. 44 fig. 2, a—c (1855); *Ch. Boweri* Murr. et Bart., Journ. Linn. Soc. Bot. 28, p. 213 (1891); *Rhodochorton violaceum* (Kütz.) Drew, Ann. Bot. 49, p. 439, fig. 1—19 (1935).

Thallus composed of a prostrate system of irregularly branched, interweaving threads and of upright, branched filaments forming penicillate tufts. — Tufts 1—3 (—5) mm high, red, sometimes with a brownish tinge, solitary or in carpetings. — Ramification alternate or sometimes opposed, typically regularly monopodial, sometimes more irregular but always rich. Branches and branchlets mostly ramifying at an angle of about 45°. — Main filaments of cylindrical cells, (7—) 9—12 (—15) μ in diam., in sexual plants thinner: 7—10 μ, 2.5—5 times longer than broad. — Cells with a central nucleus and a parietal plastid, often dissected into spirally arranged ribbons. Walls 1.7—3 μ thick, in old specimens often stratified. Terminal hairs lacking to abundant, of varying length. — Monosporangia always(?) present, often abundant, 1—2 (—3) together terminating branchlets of 2—4 cells, usually equally distributed along extensive parts of the branches, ellipsoidic, 7—10 μ broad and 8—13 (—16) μ long (smaller in sexual specimens than in asexual ones). — Tetrasporangia single, terminating the branchlets, ellipsoidic, 9—10 μ broad and 10—13 μ long. — Polyoecious but bisexual plants are much rarer than monosexual ones. — Carpogonia sessile or usually terminating branchlets, bottle-shaped, 4—6 μ in diam. at the basal portion and 9—13.5 μ in length. Trichogynes slightly broader at the distal end and before fertilization distinguished from the hairs by the absence of a wall at the basal end. — Gonimoblasts more or less regularly globular, about 50—70 μ in diam. Carposporangia ellipsoidical, inversely ovoid or pear-shaped, 9—11 μ in diam. and 10—15 μ in length. — Antheridia 1—4 together terminating branchlets, of very varying abundance, ellipsoidical or almost cylindrical, 3.5—4 μ broad and 4.5—5.5 μ long.

Fam. **Lemaneaceae.**

Lemanea Bory.

A close study of the Lemaneaceae of the French department Ille et Vilaine was published by Sirodot (1872), and this work based on not

too extensive a material has been the basis of all later accounts on the taxonomy of the algae in question.

The North-American forms have been investigated by Atkinson (1890, 1904, 1931). A modern revision of the European forms is still wanting but highly desirable. The statement in Pascher 1925: »Die zahlreichen heimischen Arten sind morphologisch gut unterscheidbar», will, at least regarding the *Sacheriae*, sound somewhat exaggerated to anybody trying to determine *Lemanea*-species according to the usual descriptions. In the following we must restrict ourselves mainly to the Swedish forms.

The genus has been subdivided into two obviously well defined sections, accepted by Sirodot as genera, viz. the *Sacheriae* and the *Eulemaneae* (= *Lemanea* s. str). The former are among other things characterized by the axial filament being naked and not surrounded by threads. Externally they are easily recognized by the cylindrical procarp-zone and the antheridia being situated on isolated papillae; besides, the chantransioid stages are only slightly branched and very fugitive. The *Eulemaneae* on the other hand have the axial filaments surrounded by slender, wound threads arising from the proximal ends of the ray-cells and forming a loose cortex. The procarp-zone is hour glass-shaped, the antheridia form coherent bands around the antherid-zone, and the chantransioid stages are well developed, richly branched and persistent. No species of the last-named section have, strangely enough, been recorded from Sweden so far, though it has appeared to have wide distribution in for instance Central Europe, the British Isles and North America. Strøm (1924) states that both *Lemanea* and *Sacheria* occur in Scandinavia.

Sirodot assigns 5 species to the *Sacheriae*. A study of the diagnoses and figures results in the impression that the species are all very closely related to each other and that the taxonomy is founded on rather superficial differences as regarding the colour and the frequency of the ramification of the filaments, the number, degree of elevation and arrangement of the antherid-papillae, whether the filaments occur solitarily or accumulated into coherent carpetings and so on.

According to literature and determination labels in the public herbaria, four of these species have been recorded from Sweden: *fluviatilis*, *rigida*, *fucina* and *mamillosa*.

Sirodot's view concerning the main differences between the four species enumerated might be summarized in the following way (Sirodot 1872 p. 70): —

A. Fertile filaments distinctly pedicelled by an abrupt contraction at the basis.
   a. Of a dark-violet colour, blackening when dry. Antherid-papillae 3—4. *fluviatilis*.

b. Of a yellowish green, olive or brownish colour which attains a darker tinge in drying. Antherid-papillae 3—4. *rigida.*

B. Fertile filaments generally gradually narrowing at the basis.

a. Fertile filament never united in compact tufts. Yellowish-olivaceous when mature. Distal ramification unilateral. Antherid-papillae 1—3. *fucina.*

b. Fertile filaments united into large compact tufts. Dark violet or brownish when mature. Branches numerous, bristle-shaped, often fasciculate. Antherid-papillae 2—4. *mamillosa.*

Atkinson (1890) mentions only two species of the section *Sacheria*, viz. *L. fluviatilis* and *L. fucina*. In the latter he includes as varieties *L. rigida* and *L. mamillosa* together with a couple of other species. Of the *L. fucina* thus obtained he says: »With the large series of forms before me it is impossible to select any important stable character which will differentiate them into good species, otherwise one could make a species for specimens from nearly each different locality. The variations of the antherid-zone and -papillae are explained by the variations of the branching of the ends of the generative filaments, which we find varies in the same specimen». The main differences between the two species are compiled in the following comparison, which consists of word-for-word extracts from the original diagnoses of Atkinson.

L. fluviatilis	*L. fucina*
1. Of a dark violet colour, generally blacking when dry.	1. Before maturity olivaceous, or yellowish-green, sometimes of an obscure tint of violet; when young usually preserving colour in drying, in age drying yellowish, greenish, or blackish.
2. Slender pedicelled.	2. Usually pedicelled by an abrupt contraction at the beginning of the fertile portion, strongly so in stout specimens.
3. Antherid-papillae in verticils of 3—4.	3. Papillae in verticils of two to seven, sometimes irregular, often confluent.
4. Procarps developed all along the generative filaments from the first cell as well as from the cells in the antherid-zone.	4. Procarps developed in and near the antherid-zone, never in the middle of the procarp-zone.

Note. By noting the origin of the procarps it is quite easy to separate *fluviatilis* from some forms of *fucina* which have been confounded with it.

It may be concluded that too much stress should not be laid upon the colour either in life or when dried. Regarding the pedicel it should

be noticed that the abrupt contraction is by Atkinson ascribed to *L. fucina*, whereas, according to Sirodot, that characteristic distinguishes *L. fluviatilis*. According to the above-cited comparison the number and arrangement of the papillae will hardly be supposed to be of any considerable importance, and the most certain distinctive feature is evidently constituted by the distribution of the procarps. It is, however, remarkable that Sirodot did not notice this obvious trait, and it may therefore well be questioned whether the name *L. fucina* was used in the same sense by both authors.

Later on Atkinson (1904) has from the var. *rigida* of *L. fucina* distinguished a new species, *L. borealis*, which in this respect seems to form a connecting link between *L. fluviatilis* and *L. fucina*, as can be concluded from the following: »carpospores in tufts throughout the entire length of the shoot, not collected at the antherid-zone as in *L fucina* and its varieties, but not extending so closely to the middle of the procarp-zone as in *L. fluviatilis*». In a posthumous paper (1931) *L. borealis* is rejected and included again in var. *rigida*, and that variety is said to comprise the bulk of the North American *Sacheriae*. It therefore seems as if there existed all intergrades between *L. fluviatilis* and *L. fucina* in Atkinson's sense.

As to the Swedish *Lemaneae*, forms directly corresponding to Atkinson's *fucina* have so far hardly been observed, though sometimes there may prove to be in the middle of the procarp-zone a short interval between the spore crowds; but variations occur even within the same shoot and on the whole there are no indications that the differences are of taxonomical interest. As a rule the spore groups form a continuous cylinder all through the procarp- and antherid-zones in the mature plants.

The variability in the »Linnéan» species *L. fluviatilis* has undoubtedly been very much underestimated, and the immense influence of certain environmental factors has not been taken into sufficient consideration. As for the colour, which plays a most important part in the determinative keys, the light is of considerable importance. The rule might be formulated thus: the more light the paler colour and the less inclination for blackening in drying. Plants growing out in the autumn and in shady places are blackish violet. In summer the colour is in the turbid water of the southern lowland waters dark olive green but in the high transparent water of the highly insolated mountain rivers always pale olivaceous. In the brown humous waters a brownish tinge is often discernible.

The dimensions are often extremely variable in different filaments of the same tuft. The ramification is generally sparse but occasionally

extremely rich. The number and arrangement of the antherid-papillae shows on the other hand a far-reaching constancy. Aberrant bristles sometimes occur together with normal ones in the same localities under circumstances indicating that the differences must be due to occasional factors rather than taxonomical differences. It would not occasion any serious difficulty to pick out in the Swedish material forms closely corresponding to most of the »species» of Sirodot, but I find no reason why they should not be regarded as mere modifications of one and the same species, *L. fluviatilis*.

For the sake of completeness it should also be mentioned that already in 1814 C. Agardh distinguished from *L. fluviatilis* a new species, *L. subtilis*, which is characterized in the following way: »filis subroseis, subgelatinosis papillosis papillis subgeminis». The author himself suspected that *L. subtilis* might represent young stages of *L. fluviatilis*, but resolved to regard it as an independent species, as it had been collected at the same time and at the same locality as that species, and as it seemed to be quite well-developed. No spores were, however, observed and it cannot therefore be doubted that the differences are entirely due to differences in age.

In the high mountain districts of Middle Sweden I discovered an interesting *Lemanea* differing from *L. fluviatilis* mainly by its smaller dimensions and by the relative shortness of the segments. Regarding these characteristics as comparatively superflous, I was at first most inclined to regard the form in question as a modification of *L. fluviatilis* caused by extreme environmental conditions, until I found it growing together with that species, both abundant, in a rivulet at relatively low level in the mountainous parts of the valley of the river Röjdån in Värmland. The two *Lemaneae* were quite distinct and not connected with one another by any intermediate forms though apparently at about the same stage of development with plenty of carpospores; and there can hardly be any doubt that the small form constitutes a distinct species which will in the following be referred to as *L. condensata* n. sp. Later it has proved to possess a wide distribution through the high-mountain chain in Scandinavia, a distribution which is of quite another type than that of *L. fluviatilis*. The two species have in Middle Sweden always been easy to distinguish, but it seems that more intermediate forms occur in Lapland, so that further investigations on the specific limits will be necessary there.

Recently Budde (1929) has described a new species, *L. hispanica*, which, according to the figures, has much in common with *L. condensata*,

but on account of the rather scanty diagnosis a closer comparison will hardly be fruitful.

It might be of some interest to emphasize that the chantransioid stages of *L. condensata* are often, especially at high levels in glacier rivulets, very well developed, which feature is said to be characteristic of the section *Eulemanea*. As this sometimes happens also in *L. fluviatilis*, especially in very shady localities, it is evidently of more relative validity for distinguishing the sections. In all other respects *L. condensata* does not seem to depart from the well defined *Sacheria*-concept.

2. *Lemanea fluviatilis* (L.) Ag.

Act. Holm., p. 40 (1814).

Syn.: *Conferva fluviatilis* L., Sp. Pl. p. 1165 (1753); *Sacheria fluviatilis* Sirod., Ann. Sc. Nat. 5, 16, p. 70, tab. 1 fig. 7 bis, tab. 2 fig. 14, tab. 3 fig. 15—19, 21, 23, tab. 6 fig. 47—50, tab. 7 fig. 62—63, tab. 8 fig. 81 (1872); Atkins., Ann. of Bot. 4, p. 221, tab. 9 fig. 52, 58 (1890).

Status chantransioides composed of irregularly branched threads interweaving to a disc and of upright filaments of limited resistance. Upright filaments more or less sparsely and irregularly branched, composed of cylindrical cells. Cells 15—22 μ in diam. and 2.5—4 times longer than broad. Terminal hairs of varying length may occur. Monosporangia unknown.

Fertile filaments usually 5—30 cm high, irregularly and usually very sparsely or sometimes richly branched, curvate, gradually tapering at the base or frequently abruptly transformed into a thin stem. Colour blackish-, brownish- or yellowish olive or blackish violet, if dark blackening in drying. — Antherid-papillae usually 3—4 in number, more or less prominent, in mature filaments usually less so, well separated and of about the same shape and size, occasionally more irregular and partly confluent. — Antherid-zones 300—1200 (—1600) μ in diam., the papillae included. — Procarp-zones cylindrical or slightly thinner or when mature even slightly broader at the middle, 250—750 (—1100) μ in diam. at the middle. — Segments 1000—3000 (—4500) μ long, 3.3—8 times longer than the diameter at the middle portion. — Procarps developed both in the antherid zone and in the entire procarp-zone or almost so. — Hairs usually none, sometimes abundant.

3. *Lemanea condensata* Israels. n. sp.

Tab. II a.

Thallus primarius nunc inconspicuus nunc plus minus valde evolutus, ad 3 mm altus. Frondes fertiles ad 3 cm altae, curvatae, simplices, basim versus parum attenuatae, nigro- vel brunneo-olivaceae.

Papillae antheridiiferae ternatim verticillatae. Segmenta 1.5—3.5-plo longiora quam in media parte lata.

Typus: Suecia: Värmland, paroec. Östmark, Vallen, 1938, G. Israelson in Mus. Bot. Upsaliensi.

Status chantransioides composed of irregularly branched filaments interweaving into a disc and of upright, more or less richly branched filaments of varying resistance. Upright filaments of cylindrical cells, 18—25 μ in diam. and usually 3—4 times longer than broad. Terminal hairs lacking or present and of varying length. Monosporangia unknown.

Fertile filaments 1—2 (—3) cm high, unbranched, curvate, not or gradually tapering at the base, blackish- or brownish-olive. — Antherid-papillae usually 3, more or less prominent. — Antherid-zones 220—350 μ in diam., the papillae included. — Procarp-zones hour glass-shaped or towards the proximal parts of the bristles cylindrical, 100—280 μ in diam. at the middle. Segments 320—830 μ long, 1.5—3.5 times longer than the width at the middle portion. — Procarps developed both along the entire procarp-zone and in the antherid-zone. — Hairs lacking or present, sometimes abundant.

Fam. **Batrachospermaceae.**

The family comprises two very closely allied genera: *Batrachospermum* and *Sirodotia*. For the vegetative system the correspondence is complete, and regarding the general appearance there are, in fact, more striking differences between different sections of *Batrachospermum*, for instance *Moniliformia* and *Setacea*, than between *Sirodotia* and the section *Viridia*. The distinctive features are the carpogonial base, which is asymmetric in *Sirodotia* but symmetric in *Batrachospermum*, and the gonimoblast, the filaments of which form a more or less compact, generally globular, body in the former genus, while they creep irregularly among the lateral branchlets in *Sirodotia*. The differences are evidently of merely gradual rather than principal nature and the genus might not unreasonably be regarded as a section of *Batrachospermum*. Skuja (1931), who has called attention to the existence of intermediate forms, is, however, of the opinion that the genus might as well be retained.

Before entering on the more special taxonomy a brief general survey of the main distinctive features may be appropriate, all the more as the present investigation has furnished a good deal of material illustrating the variation.

The sexual stages of the Batrachospermaceae form slimy, branched tufts of generally a few centimetres in length. The ramification is almost always clearly monopodial except in *B. vagum*, which is distinguished by a marked pseudodichotomous tendency. The frequency of the ramification is very variable within one and the same species, as well as the thickness of the branches, the variation of which frequently attains 3—400 % or even more, though some species are on an average broader than others. The shape and the relative width of branches of different orders often afford characteristic habitual differences which in several

cases make it possible to recognize the species, but which are hardly quite reliable.

Regarding the colour of the tufts, the Batrachospermaceae can be divided into two groups, one of which consists of species saturate green with a bluish tinge. The colour seems to be essentially independent of the light exposure, and changes usually only slightly in drying. Here belong *Sirodotia* and some sections of *Batrachospermum* such as *Viridia*, *Hybrida*, *Turficola* (except *B. vogesiacum*). *Setacea* has a more isolated position. The colour is in this section saturate olive, and in drying blackening.

In the second group, comprising the rest of *Batrachospermum*, the influence of light is very marked. Strong light effects grey colours, usually with yellowish, olive or brownish tinges, dull light, on the other hand, frequently dark olive or brownish colours often with purple reflexions. The pale colours are only slightly modified in drying while the darker ones frequently change into red or violet.

It can hardly be necessary to emphasize especially that epiphytic algae such as blue-green algae, green algae or diatoms may cause considerable deviations when copiously developed. Characteristic reddish brown tinges, probably caused by precipitation of iron compounds in the membranes and mucilage envelope, occur sometimes.

The branches have the shape of strings of beads and consist of a central axis and whorls of lateral branchlets or primary ramuli. The central axis is mainly composed of a single row of large, elongate cells which in their distal ends give rise to a whorl of smaller »basal cells» of the primary ramuli each developing a varying number of fascicles (Sirodot's »fascicules secondaires») of richly branched filaments. From the basal cells there are also developed downward growing, irregularly branched filaments, the cortical threads, forming the cortex of the central axis.

The shape of the whorls — if they are confluent or separated, which is largely determined by the relative length of the internodia — constitute characteristics of considerable importance for the habitus. These characteristics have also frequently been used in the taxonomy of *Batrachospermum*, though they are very variable within one and the same species and, as it seems, of very limited value.

The primary ramuli are very variable in several respects as regarding the number of cell-storeys and the dimensions and shape of the cells. Sirodot has shown that in several species the terminal fascicles often have bigger cells than the lateral ones even within one and the same whorl. Nevertheless the absolute and relative dimensions and the shape

of the cells at different levels in the fascicles and other details determining the general appearance of the ramuli afford highly characteristic differences often of considerable interest for the taxonomy.

From the cortical threads there arise branchlets of the same appearance as the primary ramuli; they are called secondary ramuli. In some species they are said to be entirely lacking, in others frequent. The differences seem, however, to be quantitative rather than fundamental.

The frequency and length of the hyaline hairs terminating the ramuli afford no reliable characteristics for distinguishing species, though a distinct tendency is obvious in some cases. In *B. ectocarpum* for instance the hairs are almost always entirely lacking.

Organs termed monosporangia are to be found in both the primary asexual stages and the sexual shoots. However, while they seem to be regular bodies of propagation in all chantransioid stages of *Batrachospermum*, they are found only exceptionally in the *Batrachospermum* plants themselves. In the last case the monosporangia are certainly in most cases accompanied by sexual organs, i. e. first and foremost carpogonia, but these are commonly far less frequent than in plants without monosporangia. Antheridia seem to occur less frequently, and this may be one of the reasons why, except on rare occasions, the plants remain sterile. The monosporangia occupy the ordinary place of the antheridia terminating the distal branchlets of the ramuli. They are distinctly ellipsioidical in shape and thereby can easily be distinguished from the antheridia, which are generally globular. Further, the dimensions of the monosporangia are larger than those of the antheridia. The plastids are retained, which is mostly not the case with the antheridia, which therefore seem colourless. Monosporangia occur in two Swedish species, viz. *B. vagum* and *B. sporulans*. Especially for the last-named species, they are of a decisive taxonomical importance. On the whole *B. sporulans* can at the moment be defined merely by the presence of monosporangia.

The system of sexual propagation affords the greatest interest in this connection, all the more as specimens entirely devoid of sexual organs are rarely met with, provided that they are not very young; and this is especially true for species not reproducing by monosporangia.

The distribution of sex within most sections of *Batrachospermum* is subject to considerable variation and since the days of Sirodot has played a most important part in the taxonomy. According to this author *Helminthoidea* comprises a couple of monoecious, one dioecious and one polyoecious species, *Setacea* one monoecious and one dioecious, *Viridia* one monoecious and several dioecious species. *Moniliformia*, on the other

hand, comprises only monoecious species, but KYLIN has later discovered a dioecious species of this section. When studying the diagnoses one is struck by the fact that every dioecious species corresponds to at least one monoecious or polyoecious parallel species. Apart from the different distribution of sex these parallel species show practically complete conformity, as will be further discussed later on. The surmise must then be said to lie very near to hand that the parallel species merely constitute unisexual and bisexual forms respectively of one and the same species. In fact it has proved that there is every reason for uniting the monoecious and dioecious parallel species both from a morphological and from ecological and geographical points of view. On the whole the distribution of sex cannot be ascribed any deciding taxonomic value (cf. the existence of bisexual specimens in *Chantransia* communicated in a preceding chapter). On the other hand a distinct tendency is often clear. *B. Boryanum* is thus preferably dioecious, while *B. Crouanianum* is only extremely rarely so. *B. atrum* is in Sweden almost always monoecious; on the continent the opposite conditions are reported to be prevalent, as the unisexual *B. Dillenii* is more commonly found than the bisexual *B. Gallaei.*

The carpogonium-bearing branches arise from the basal cells or from cells of the fascicles. They are always provided with branchlets, bractea, which are of a characteristic appearance often significant for the different sections. Sometimes carpogonia terminate single bractea, which fact has been used as a diagnostic feature, evidently erroneously as this phenomenon has been observed occasionally in several species belonging to different sections and must probably be regarded as an abnormity, as the carpogonia of the bractea never seem to develop into gonimoblasts.

The shape of the trichogyne constitutes the evidently very acceptable basis of the division of the genus into sections. For the distinguishing of different species within one and the same genus it seems to be of more limited value.

The shape of the gonimoblasts of *Batrachospermum* is fairly regularly globular or semiglobular except in the section *Setacea* where they are more wart-like.

Regarding the location and number of the gonimoblasts, the species with globular gonimoblasts might be divided into two groups. In the first of these, the »polygonimoblastic» forms, the gonimoblasts are small and numerous and scattered through the whorl more or less distant from the centre. Here belong the sections *Moniliformia* and *Helminthoidea.* The second group, comprising the monogonimoblastic forms, *Hybrida, Viridia* and *Turficola*, is characterized by comparatively

big and centrally inserted gonimoblasts, one (or sometimes two) in every whorl.

Regarding the more detailed position of the gonimoblasts, there is in the polygonimoblastic forms a considerable variability, especially in *Moniliformia*.

Special stress has often been laid upon the occurrence of single gonimoblasts outside the whorls and several such »ectocarpic» species have been described in the section *Moniliformia*. It proves, however, that analogous forms are also quite common in the second polygonimoblastic section, *Helminthoidea*, and on the whole such characteristics should be used with much criticism in taxonomy.

The antheridia terminate the distal cells of the ramuli or the bractea. As a rule they are globular or almost globular but slightly ellipsoidical types have also been met with. Generally they are of fairly constant dimensions, about 6 μ in diam., all through the family, though somewhat larger as well as slightly smaller types may occur. Deviations have been observed within several species and there are no indications that they are of importance.

Some of the *Batrachospermum*-species of Sirodot were distinguishable merely or mainly by mostly unimportant details concerning the chantransioid stages, which differ in colour, length, presence or absence of terminal hairs, or the position of the monosporangia. From considerations of principle too, this kind of taxonomy seems to be dubious. The chantransioid stage is the simpler and more primitive, the sexual plant the more differentiated one. It is therefore to be expected that the specific characteristics must also be more differentiated and easier to characterize in the *Batrachospermum*-plants themselves. If two species cannot be separated from each other by the sexual shoots it is consequently hardly likely that they can be so by the protonemal growth. It is a well-known fact that in several other groups of organisms vegetative marks are not sufficient for the determination of species; sexual stages are required.

Moreover, most of the morphological traits used are evidently of little taxonomic interest, and finally the statements of Sirodot regarding the identifying of the chantransioid stages cannot be unreservedly accepted. On the whole we still know so little about this subject that no certain conclusions should be drawn from the chantransioid stages as to the presence of determined species of *Batrachospermum*.

Batrachospermum Roth.

This genus is the most important among the freshwater Florideae generally, and according to Skuja (1938 b) it comprises not less than 60 % of all species known.

The basic taxonomical work is Sirodot's »Les Batrachospermes» (1884) an extensive monograph provided with a rich and beautiful material of plates and treating mainly the Bretonic forms. In the multitude of forms met with, the author distinguished a great many species and varieties which were carefully described. Although Sirodot was by no means devoid of eye for the immense variability of these species, which is on the contrary perpetually emphasized, he did not avoid the mistake — rather characteristic of many phycologists of those days — of using in several cases unimportant and more incidental morphological differences in distinguishing taxonomical units. The leading principle in critical cases seems to be expressed in the following (p. 243): »Je n'admets la variété qu'autant que les formes qu'elle groupe se représentent avec une certaine constance dans une localité qui n'a subi aucune modification apparente».

It seems that Sirodot overlooked the possibility, indeed very probable, that several morphological features depend on environmental factors showing a far-reaching local constancy. In any case a great many, perhaps the majority, of the species and varieties of Sirodot must be regarded as merely local forms. The determination of species according to Sirodot's monograph is therefore a rather delicate task, and the system of the author was subject to much criticism. Brand (1909 p. 112) expresses his complaint in the following words: »Es ist mir noch niemals ein Exemplar vorgekommen, welches mit einer 'Art' dieses Autors vollständig übereingestimmt hätte».

The reduction undertaken in the monograph on the Swedish Batrachospermaceae of Kylin (1912) means an important step in the direction of a useful system. The species of Kylin seem to have been accepted by most authors; Hamel (1925), however, retains the classic system of Sirodot practically unchanged. Skuja, who has undertaken a world-wide revision of the family, seems to take an intermediate position between Kylin and Sirodot with regard to the circumscription of the species (cf. the list of species in Skuja 1930).

There are a few indications in literature that not even the species of Kylin are always easy to distinguish (cf. Budde 1933). Further revisions of the system thus seem to be needed, an idea which is confirmed by my experiences of a rather comprehensive Swedish material.

Sect. **Moniliformia** Sirod. 1884 p. 205.

Not saturate green. Carpogonial branches usually arising from the fascicles, sometimes from the basal cells of the primary ramuli. Trichogynes club- or finally often urn-shaped. Gonimoblasts pedunculate, globular, small, numerous, scattered within the whorl at various distances from the centre. Bractea elongate, usually embracing the carpogonia and the gonimoblasts.

Batrachospermum moniliforme, our beyond all comparison commonest species of the genus, shows an extraordinary variability important for the general habitus in several respects, such as dimensions of the frond, colour, wideness of the branches, ramification, shape of the whorls and so on.

Considering differences of these kinds and others as regarding the frequency and length of the hairs, shape and position of the antheridia-bearing cells, and frequency and distribution of the gonimoblasts, Sirodot enumerates a considerable number of species and varieties. Herewith all existing forms were by no means classed; on the contrary he remarks (p. 211): »L'espèce se présente sous des formes si diverses que les variétés pourraient être multipliées à l'infini»; but with regard to the variation often met with in one and the same locality he tried to limit the number of units as far as possible.

The great majority of the *Moniliformiae* consists of very closely related forms grouping themselves naturally around *B. moniliforme*, and later investigators are invariably inclined to reductions. Kylin advanced furthest in this direction: of all the species in question he distinguishes only two in Sweden, viz. *B. moniliforme* and *B. densum*. Some recent authors have tried to maintain more units within this series of forms. Schiller (in Pascher 1925) retains the *B. pyramidale* of Sirodot. Skuja (1933) also mentions that species together with a couple of varieties of *B. moniliforme*. Cedergren (1932) records a »var. *Decaisneanum* (Sirod.) n. comb.» which is however characterized in a rather insignificant manner.

A more detailed treatment of all the Swedish forms would be of little profit. I shall therefore confine myself to a brief discussion of some more interesting types. Among the *Moniliformiae* of Sirodot there are some typically perennial species. The hibernation is effected by the basal portions of the thallus, which are distinctly distinguished from the »normal» ones by the colour, which is darker (in drying black) and the consistence which is firmer and more corneous. The whorls are always definitely confluent and indistinguishable to the naked eye. For details concerning the morphology and anatomy the reader is referred

to Sirodot (cfr also Pl. XV, fig. 4 and Pl. XVI, fig. 5). Conditions being suitable for growth again the old fronds develop new shoots, prolificate. To this group belong *B. pyramidale* and *B. densum*. The former is rejected by Kylin and included in *B. moniliforme*, while the latter is retained and characterized by the perennial prolificating fronds. The same structures are according to this author sometimes met with also in *B. moniliforme*, which may cause difficulties in limiting the two species from one another. Still, Kylin does not hesitate in maintaining *B. densum* as a species, as it is easily recognized by its characteristic habitus: »Die Zweige sind nämlich bei *B. densum* schmäler und schlanker als bei *B. moniliforme*, während aber die Zentralachse durchgehends etwas gröber ist, was auf der reichlicheren Ausbildung von Berindungsfäden beruht. Die Endtriebe sind bei *B. densum* verhältnismässig kürzer, und bilden einen beinahe geraden Winkel mit ihrer Mutterachse. Die Glieder sind bei *B. densum* beinahe immer vollständig zusammenfliessend, und ihre Höhe ist nur $^1/_4$—$^1/_2$ mal so gross wie ihre Breite» (p. 19). As the habitus is in the genus subject to considerable variation in different respects, difficulties must be expected in separating clearly species which are in fact distinguished mainly by habitual features.

With regard to the width of the branches, typical *B. densum* is undoubtedly on an average thinner than typical *B. moniliforme*. In the former the diameter is mostly 450—700 μ, in the latter 600—1000 μ. There are, however, often considerable differences even in one and the same locality. Moreover *B. densum* is sometimes 800—900 μ wide; still more often thinner forms of *B. moniliforme* are met with, e. g. 400—500 μ.

The diameter of the central axis is a function of the age of the shoots. Older portions of the thallus have the cortical thread-system better developed, which naturally causes an increased width of the central axis; and in this respect there do not exist any fundamental differences between *B. densum* and the *pyramidale*-like forms of *B. moniliforme*.

Regarding the height of the whorls, Kylin seems to draw the limit more narrowly than does Sirodot. Specimens with the typical *densum*-habitus, however, often prove to possess some parts of the frond where the internodia reach $^4/_5$ of the diameter of the whorls. In *B. moniliforme* the height of the whorls generally varies from $^1/_1$ to $^1/_2$ of the diameter.

The gonimoblasts are said to be less numerous but of larger dimensions in *B. densum* than in *B. moniliforme*.

In almost every locality of *B. densum* intermediate forms are to be found, and not seldom both types occur quite typically developed in the

same river together with plenty of transitory forms, but regarding the structural details no fundamental differences seem to exist.

It can often be observed that plants living in more turbulent portions of a river are more *densum*-like than those inhabiting quieter biotopes. But there can be no doubt that the length of the internodia is a function of yet other factors than the velocity of current. It is of interest in this connection that typical *B. densum* is far more often met with in late summer and autumn than at earlier seasons. In the early summer the stretching of the internodia is more pronounced. Autumnal specimens of *B. densum* sometimes show a clear difference between the proximal and the distal halves of the thallus, the former showing ellipsoidical and well separated whorls strongly contrasting with the discoid and confluent whorls of the latter. In old specimens of *B. pyramidale* collected in early summer there is also generally a marked difference, with regard to most of the characteristics discussed above, between the old hibernated portions and the young prolificating shoots; but of an inverse order, as is seen from the following comparison of different portions of one and the same plant collected in a river in Dalarna in June.

	Fresh shoots	Hibernated shoots
Shape of the whorls	globular	discoid
Diam. of the whorls	450—550 μ	450—510 μ
Length of the internodia	515—550 μ	100—300 μ
Diam. of the central axis	50—55 μ	65—85 μ
Number of gonimoblasts	3—5	0—1
Diam. of the gonimoblasts	65—85 μ	160—190 μ
Location of the gonimoblasts . . .	always included	always exserted

Summing up, we find that *B. densum*, though undeniably of a most characteristic appearance when occurring in its typical form, is by no means sharply distinguishable from the *B. pyramidale*-like forms of *B. moniliforme*. As shown by the map figure 14, p. 87, the distribution-areas conform in all essentials. Perhaps *B. densum* is nothing but an extreme form of *B. pyramidale*.

As to the latter it is a notable fact that the distribution is rather distinctly limited, this seeming to indicate the presence of a distinct species. In the sense defined above it is never met with in the eutrophic streams of the lowland plains, nor in the high transparent water of the mountains. On the whole it seems to be restricted to the brown oligotrophic humus-waters, of which it seems to be a good indicator. It must, however, be emphasized that a definite limit against other forms of *B. moniliforme* can by no means be drawn. The young though fertile

shoots of *B. pyramidale* are not distinguishable from those of that species. The occurrence of corneous basal portions of the thallus, by means of which the plant is able to survive periods of checked growth, cannot be regarded as a characteristic of real taxonomical value, as it is sometimes met with in several other species too; but should probably be regarded as a mere modification caused by the influence of some environmental factors, though the course of causality is uncertain.

In the following, *B. pyramidale* and *B. densum* will be referred to as f. *pyramidale* (Sirod.) n. comb. and f. *densum* (Sirod.) n. comb. respectively.

It might be asked why both forms are retained though there are plenty of intermediate forms, and though they show a striking similarity concerning ecology and distribution. The answer is that f. *densum* can be distinguished even in younger stages and in the absence of the characteristic old thallus bases. Moreover it seems to be a still more definite indicator-form of a certain type of water than f. *pyramidale* is.

Batrachospermum moniliforme in its broadest sense has in Sweden an extraordinarily wide ecological amplitude and distribution area, and in these respects it exceeds all other species of the genus. It is therefore to be expected that the differentiation of forms must have advanced especially far. In fact the possibility cannot be rejected that the »Linnéan« species *B. moniliforme* includes a number of smaller but real taxonomical units. Whether this is true or not can hardly be decided without experimental work. The variability with the environmental factors has, however, such an extent that the distinguishing of these possible units in nature will present serious difficulties, as the characteristics will probably prove to be largely transgredient.

Skuja (1928) has described a var. *isoëticola* of *B. moniliforme* living on *Isoëtes* at about 2 m. depth in a lake in Estonia, and above all characterized by the unusually small diameter of the whorls: 190—300 μ. Dr G. Lohammar has kindly brought me a vial from a lake in Dalarna (Folkärna: Västanberg, Dammsjön) which contained a form corresponding to the diagnosis of Skuja in every respect and living under similar conditions of life. It is, however, of interest to note that more intermediate forms have been obtained from other lakes. On the whole there seem to exist all intergrades between var. *isoëticola* and the stream forms of *B. moniliforme*, and the former is surely a mere modification.

Among the remaining species of the section *Moniliformia*, *B. sporulans* is characterized by the vegetative propagation by means of monosporangia. Carpogonia are generally present, though mostly less frequent; but fertilization seldom takes place and developed gonimoblasts are rarely

met wih. I have never succeeded in obtaining spermatangia, which have, however, been described by Sirodot. Kylin emphasizes one more distinctive feature, viz. the carpogonial branches composed of short, disc-shaped cells inserted from the basal cells of the ramuli. That may be the rule, but Sirodot's figure (Pl. 11, fig. 7) is hardly typical in this respect, and sometimes forms have been observed where the carpogonial branches have not arisen from the basal cells but from other cells of the ramuli; and in this case they are hardly distiguishable from those of *B. moniliforme*. On the whole *B. sporulans* seems to show an apparent conformity in all other respects with that species, and the presence of monosporangia seems to be the single reliable feature in distinguishing the two species. It is of great fundamental interest that when it occurs together with *B. moniliforme* which is very common in certain districts, *B. sporulans* varies parallel to that species, this constituting more evidence for the immense importance of the environmental factors for the development of forms. Forms habitually hardly distinguishable from f. *pyramidale* and f. *densum* have also been observed.

It remains to discuss two more species of the section, viz. *B. ectocarpum* and *B. arcuatum*, which have in common that some of the gonimoblasts reach outside the whorls.

Kylin, who described the latter as a new species, noting the presence of similar features in the two species, writes: »Beide Arten sind aber von einander dadurch deutlich unterschieden, dass *B. ectocarpum* monözisch ist, *B. arcuatum* dagegen diözisch» (p. 24). It is, however, significant that in the original material of *B. arcuatum* from Kvarnbo in the vicinity of Uppsala there are also clearly bisexual plants. Skuja (1933) reports a Fennian form of *B. arcuatum* with the following note: »die Form stimmt in allen vegetativen Merkmalen mit dem Typus überein, nur ist sie monözisch». And as a matter of fact there occur in Middle Sweden all conceivable intergrades between typically bisexual specimens with both antheridia and carpogonia richly developed, via forms with abundant antheridia but rare carpogonia or abundant carpogonia and rare antheridia, up to strictly unisexual plants, though the first mentioned types are in the minority. No principal differences regarding the ecology or regional distribution have been observed. There would be no sense in maintaining two different species based upon the different distribution of sex.

In any case, there can be no doubt that *B. arcuatum* is a very well defined species not only distinguished by regular polyoecy, which has so far not been established elsewhere within the section — the only exceptionally fructifying *B. sporulans* hardly excepted, as exclusively,

female specimens are certainly the rule, male plants never having been found. The general appearance of the primary ramuli with the characteristical curved distal branches, for instance, is without any correspondence among our other species

B. ectocarpum is in several respects far less clear. Sirodot enumerates two ectocarpic species besides this one, viz. *B. corbula* and *B. Godronianum*. The latter is probably closely related to the same author's *B. densum*.

Kylin doubts the possibility of keeping *B. ectocarpum* and *B. corbula* apart, and includes the latter in the former. To judge from the diagnosis and figures of the author Sirodot's *B. corbula* is in all essentials identical with *B. moniliforme*, and is probably to be regarded as an aberrant form of this species with some gonimoblasts exserted. This opinion is confirmed by the communications of Price and Budde. Price reports *B. corbula* from a locality im Cambridgeshire where it occurred together with *B. moniliforme*. The species were, however, not distinct, but melted into each other. Budde (1933) observed in Westphalia intermediate forms between *B. moniliforme* and *B. ectocarpum*. A microphoto of the »*ectocarpum*» of Budde shows, however, a type very closely related to f. *densum* of *B. moniliforme*, and the figured form, at least, has evidently not much to do with Sirodot's or Kylin's *ectocarpum* (Pl. 13 figs. 1, 2). To throw more light upon the importance of »ectocarpy» as a specific trait, it might be mentioned that, according to Sirodot, even in a species such as *B. radians*, which has the gonimoblasts typically accumulated in the central half of the whorls, they may occasionally exceed the periphery of the whorl.

The Swedish specimens seen, which have been called *B. ectocarpum* by Kylin, are in my opinion likewise nothing but slightly differing forms of *B. moniliforme*.

Regarding the *B. ectocarpum* of Sirodot, on the other hand, several features indicate that the species is more different from *B. corbula* and *B. moniliforme*. The slightly curved distal branchlets remind one very much of *B. arcuatum*. A number of other characteristics — each by themselves perhaps of less importance but nevertheless strikingly significant for that species — might be added, for instance the very strongly developed mucilage envelope of the thallus, the unilateral ramification tendency of the ramuli, the lack of terminal hairs and secondary ramuli and the peripheral position in the whorls of the antheridia and gonimoblasts. The reports of the ecology point in the same direction. On the whole everything seems to speak in favour of the opinion that *B. ectocarpum* of Sirodot is identical with *B. arcuatum* of Kylin. All species examined

by Sirodot were bisexual. It should however be noticed that the spermatangia are said to be sometimes very rare, — this perhaps indicating a polyoecious tendency — which is indeed very often characteristic of *B. arcuatum* in Sweden. Of considerable interest in this connection is also *B. pulchrum* Sirod. from Guiana, about which Sirodot remarks that it is very similar to *B. ectocarpum:* »La position de ces dernieres glomérules est le seul fait que éloigne les échantillons du *B. ectocarpum*, et encore n'est-il pas exclusif» (p. 225). The specimens seen were, however, strictly female. It is probable that all three species are identical. Without examining the original specimens of Sirodot it is, certainly, hardly possible to decide the matter definitely, but the evidences seem to be sufficiently accordant to state the reasons for retaining *B. ectocarpum* Sirod. for *B. arcuatum* Kylin.

4. ***Batrachospermum moniliforme*** Roth

Tent. Fl. germ. III p. 480 (1800); Sirod. Batr. p. 209, tab. 1 fig. 1—3, tab. 2 fig. 1—3, tab. 3 fig. 1; Kylin, Stud. schwed. Batr. p. 15 fig. 4. Tab. III a.

Syn.: *B. Decaisneanum* Sirod. Batr. p. 214, tab. 1 fig. 4; *B. radians* Sirod. Batr. p. 218, tab. 1 fig. 5, tab. 2 fig. 4, 14.

Exs.: Aresch., Alg. Scand. exsicc. n. 17; Wittr. et Nordst., Alg. exsicc. n. 1355 a, 1357.

Tufts 2—6 cm high, very mucilaginous, usually grey with olive or yellowish tinges or brownish. — Ramification more or less rich and regular with distinct main axes; branches usually not much thinner at the insertion than the mother-axis, almost cylindrical with blunt-roundish apex. — Central axes 50—120 μ wide; cortical threads abundant. — Whorls globular, ellipsoidical or barrel-shaped, more or less separated or confluent, (200—) 500—800 (—1050) μ in diam. — Internodia 300—800 μ long. — Fascicles 3—5, composed of (6—) 8—16 (—20) cell-storeys, richly branched; distal ends straight. Cells cylindrical — elongate ellipsoidical, fusiform or inversely ovoid, comparatively uniform; the proximal ones 5—10 (—12) μ wide, 20—60 μ long. — Secondary ramuli more or less frequent, of varying length. Terminal hairs usually present, of varying abundance and length. Monosporangia unknown. — Antheridia terminating the ramuli, globular or almost globular, 5—6.5 μ wide, 5—7.5 μ long. — Carpogonial branches arising from the fascicles or from the basal cells. Carpogonia 4—6 μ wide at the basal portion, 20—40 μ long. Trichogynes club- or urn-shaped. Bractea numerous, elongate, embracing the carpogonium and finally the gonimoblast. — Gonimoblasts scattered within the whorls at different levels, in some forms partly exserted (*B. corbula* Sirod.?, *B. ectocarpum* in the sense of Kylin), usually numerous, globular, 70—120 μ in diam. — Carposporangia ellipsoidic, ovoid or pear-shaped, 6—10 μ wide, 10—13 μ long.

Note. The measurements of the whorls, central axes, and internodia communicated in the diagnoses refer to not too young portions of the main branches of the tufts.

f. *pyramidale* (Sirod.) Israels. n. comb.

Syn.: *B. pyramidale* Sirod., Batr. p. 232, tab. 15 fig. 1—4, tab. 16 fig. 1—5; *B. pygmaeum* Sirod., Batr. p. 230, tab. 19 fig. 1—4.

Distinguished from the species by the firm, corneous, dark and prolificating basal portions of the thallus by means of which the plant is able to survive periods of checked growth. Whorls ellipsoidic or barrel-shaped, separated or confluent.

f. *densum* (Sirod.) Israels. n. comb,

Syn.: *B. densum* Sirod., Batr. p. 228, tab. 12 fig. 1—2, tab. 13 fig. 1—11; Kylin, Stud. schwed. Batr. p. 17.

With prolificating basal thallus-portions as f. *pyramidale*. Whorls disc-shaped, usually confluent, internodia very short. Ramifying at almost right angles.

5. *Batrachospermum sporulans* Sirod.

Batr. p. 216, tab. 11, fig. 1—15 (1884); Kylin, Stud. schwed. Batr. p. 20, fig. 5.

Tufts 1—6 cm high, very mucilaginous, greyish with olive or brownish tinges. Ramification rich, more or less regular and monopodial; branches almost cylindrical with blunt roundish apex. — Central axes 50—70 (—120) μ wide, cortical threads frequent. — Whorls globular, ellipsoidical or rarely disc-shaped, usually more or less separated, sometimes confluent (400—) 700—900 (—1100) μ in diam. — Internodia generally 450—700, sometimes longer than the diameter of the whorls; Sirodot's figure (tab. 11 fig. 1) represents, however, an extreme type. — Fascicles 3—4; cell-storeys (5—) 10—16 (—20); richly branched, straight; cells cylindrical or frequently fusiform, elongate ellipsoidical or inversely ovoid; proximal cells 5—8 (12) μ broad, 30—60 μ long. — Secondary ramuli more or less frequent, finally reaching the length of the primary ones. — Terminal hairs generally abundant, sometimes lacking. — Monosporangia terminating the ramuli, mostly single or in couple, ellipsoidic, 7—10 μ wide, 8—13 μ long. — Monoecious. — Antheridia very rare (observed by Sirodot), terminating the ramuli, globular. — Carpogonial branches usually arising from the basal cells, exceptionally also from the ramuli, of varying length; if inserted at the basal cells composed of disc-shaped cells, if not so of cells which are not different from the ordinary cells of the ramuli. — Carpogonia often aborted, 4—7 μ wide at the basal portion, 30—50 μ long. Trichogynes club- or urn-shaped. Bractea rather frequent, elongate. — Gonimoblasts only exceptionally developed, globular, 70—120 μ in diam., Carposporangia ellipsoidical, inversely ovoid or pear-shaped, 7.5—9 μ broad, 8—11 μ long.

6. *Batrachospermum ectocarpum* Sirod.

Batr. p. 222, tab. 7 fig. 1—5 (non Kylin p. 21). Tab. III b.

Syn.: *B. pulchrum* Sirod., Batr. p. 225 (?); *B. arcuatum* Kylin, Stud. schwed. Batr. p. 22, fig. 7 (1912).

Exs.: Wittr. et Nordst., Alg. exsicc. n. 1356 b p. p., p. p. *B. Crouanianum* Sirod.

Tufts 2—10 cm high, extremely mucilaginous, greyish or brownish olivaceous; limited parts of the thallus occasionally brightly light green, this colour rarely extended to the entire plant. Ramification generally rich and more or less regular with distinct main-shoots; branches much thinner at the insertion than the mother-axis, gradually tapering, this resulting in a habitus very similar to that of *Helminthoideae*. — Central axes 80—135 μ wide; cortical threads frequently developed. — Whorls ellipsoidical, or barrel-shaped, rarely globular, separated or confluent, 700—1500 (—1900) μ in diam. — Internodia 400—1000 μ long. — Fascicles 3—5 of equal type, composed of 12—20 cell-storeys, richly branched, branches often unilateral in series through more or less extensive portions, straight except for the terminal portions which are mostly markedly curvate. Proximal cells cylindrical, frequently with swollen ends, 8—18 μ wide and 25—80 μ long, middle cells fusiform or elongate cylindrical, distal cells ellipsoidical or inversely ovoid. — Secondary ramuli sparse or in the basal portions finally abundant but not reaching the length of the primary ramuli. Terminal hairs almost always lacking, rarely numerous. — Monosporangia unknown. Polyoecious. Antheridia in large quantities in male specimen, often very sparse in monoecious ones, terminating the ramuli, globular or almost globular, 5.5—6 (—7) μ broad, 5.5—6.5 (8) μ long. — Carpogonial branches arising as branchlets of the fascicles or from the basal cells, of variable length, composed of elongate cells. Carpogonia 4—5 μ wide at the basal portion, 20—40 μ long. Trichogynes elongate club-shaped. Bractea numerous, long, embracing the carpogonia and later the gonimoblasts. — Gonimoblasts scattered close to the periphery, some exserted, numerous, globular, 130—185 μ in diam.; axes when centrally inserted often very thick. Carposporangia ovoid or pear-shaped, 9—12 μ broad, 12—16 μ long.

Sect. **Helminthoidea** Sirod. p. 239.

Not saturate green. Carpogonial branches arising from the fascicles or from the basal cells. Trichogynes ellipsoidical or ovoid. Gonimoblasts pedunculate, small, globular, numerous, scattered in the whorl. Bractea short.

Sirodot described four species of the section *Helminthoidea*. Two of these are monoecious, viz. *B. helminthosum* and *B. Crouanianum*, distinguished from one another merely by the presence and absence respectively of antheridia at the bractea. *B. Boryanum* is dioecious and *B. anatinum* polyoecious. The author tells of one case where three of them occurred in one and the same brook; uppermost *B. helminthosum*, below *B. Boryanum*, and nethermost *B. anatinum*. The monoecious specimens of the last-named species resemble *B. helminthosum* in certain

respects not mentioned in detail, whereas the dioecious plants have features in common with *B. Boryanum*. Sirodot alludes to the possibility that *B. anatinum* might therefore be a hybrid of the two other species. However, emphasizing that the chantransioid stages are very different from those of *B. helminthosum* and *B. Boryanum*, he himself rejects this not very convincing hypothesis. Leaving the chantransioid stages altogether out of the discussion, there seems to remain at least one other possibility, viz. that *B. anatinum* was in reality a mixture of *B. helminthosum* and *B. Boryanum*, the two species actually being sometimes found growing together in the same localities. Whether this explanation is the right one or not can hardly be established without an examination of the original specimens of Sirodot.

In any case, the descriptions of the author will not be sufficient in practice to distinguish the dioecious forms of *B. anatinum* from *B. Boryanum* or the monoecious ones from *B. helminthosum*. Just this fact will, for the present at least, give the reasons for rejecting the name *B. anatinum*. Kylin, indeed, records both *B. Boryanum* and *B. anatinum* from Sweden, the last named species from merely one locality, all specimens observed being strictly female. No reasons are however given as to why these specimens might not equally well belong to *B. Boryanum*.

Moreover, on one occasion Sirodot already examined a male specimen of *B. Boryanum* which proved to have one branch with both antheridia and carpogonia. Budde (1933) reports a similar case where a female specimen was provided with sparse antheridia in some portions of the thallus.

As to the Swedish forms, *B. Boryanum* undeniably shows an apparent dioecious tendency. Not infrequently, however, it clearly exposes its polyoecious character, and uni- and bisexual plants fully agreeing with one another in every other respect are sometimes found growing together in the same localities and at the same time. In a brook in South Sweden, for instance, I once collected three specimens, one male, one female and one bisexual, with both antheridia and carpogonia well developed. Analogous observations have been made in material from all Swedish districts where *B. Boryanum* occurs more frequently. Sometimes only bisexual specimens are obtained.

The establishment of this fact opens up a series of taxonomical problems within this rather critical section, the first concerning the relations between *B. helminthosum* and *B. Boryanum*. The possible surmise that these might be nothing but forms of one and the same species must be definitely rejected on both morphological and ecologico-geographical indications. In separating the two species, we are, however,

mainly left to vegetative differences. The ramuli especially afford excellent distinguishing possibilities, and no difficulties have been met with in keeping the species apart, even if they occur together in one and the same locality. The ramuli in *B. Boryanum* ramify at wider angles than in *B. helminthosum*, this effecting a more outspread appearance in the former.

Further, the cells of the ramuli are in *B. Boryanum* thicker and thicker-walled throughout and the differences in shape between cells from different storeys are not so pronounced as in *B. helminthosum*. The distal cells are in the latter clearly broader than the medial ones, whereas this is not the case in the former. The differences will appear better than in words from figures c and d, Plate III, representing ramuli from specimens of *B. Boryanum* and *B. helminthosum* collected in the same locality.

The distribution areas are also very different, and for further information on this subject the reader is referred to p. 79 and 89.

In the case of purely unisexual plants there is every probability for the presence of *B. Boryanum*. Still, the matter cannot be regarded as decided. *B. helminthosum* is certainly reported everywhere to be exclusively monoecious, but sometimes the antheridia are not to be found, and it is most likely that the *B. anatinum* of Kylin should be regarded as such female plants of *B. helminthosum*. Exclusively male plants of that species have hitherto not been met with in Sweden, but they have in Norway. In a rivulet near Buruen in Ytre Rendal (Hedmark) I have collected a material of *B. helminthosum* which proved to contain both male and bisexual specimens.

The matter is still more complicated by the record of one more monoecious species, viz. *B. distensum*, described by Kylin. The main differences between *B. helminthosum* and *B. distensum* are, according to the author, the following:

B. helminthosum:

1. bractea never with carpogonia;
2. branches of the ramuli not especially divergent;
3. their proximal cells 6—12 times as long as broad;
4. antheridia only terminating the ordinary *ramuli*;
5. secondary ramuli frequent.

B. distensum:

1. bractea often with carpogonia;
2. branches of the ramuli very divergent;
3. their proximal cells 4—6 times as long as wide;
4. antheridia often on »special» fasciculated branch-systems;
5. secondary ramuli lacking or very rare.

The first of these distinguishing features was evidently considered by the author to be most important, as it has been used in the determination key. Budde (1933), however, remarks that he had in otherwise typical *B. helminthosum* occasionally observed carpogonia terminating bractea. In fact an investigation of a more extensive material will show that this is by no means rare. Moreover, this feature is now and then observed in several other species even belonging to other sections of the genus such as *B. moniliforme*, *B. arcuatum* and *B. vagum*, and is evidently of no fundamental importance.

Nevertheless the remaining differences are always sufficient to distinguish the two species. It has proved that in *B. distensum* regarding fundamental details the ramuli are of exactly the same type as in *B. Boryanum*. The limit between the latter two species will then be far less clear. Kylin, relying upon the stability of the distribution of sex, does not consider this problem. As the polyoecy of *B. Boryanum* is a fact, *B. distensum* might be nothing but monoecious forms of the former. In any case there still remain some facts indicating that *B. distensum* constitutes a separate taxonomical unit, though it must be emphasized that it is still rather imperfectly known, the known localities being comparatively few. Apart from the monoecious tendency (so far no unisexual specimens have been seen), some details concerning the distribution are of interest in this connection. *B. Boryanum* seems to be restricted in Sweden to more calcareous waters, but *B. distensum* has a much wider ecological amplitude, being met with in both limestone districts and the oligotrophic parts of southern Sweden poor in lime. As to the morphology, *B. distensum* has, as pointed out by Kylin, comparatively short proximal cells of the ramuli, whereas this is not the case to the same extent in *B. Boryanum*. It seems, however, to be difficult to establish any definite limits in this respect. I therefore find it safest to regard *B. distensum* merely as a variety of *B. Boryanum* and it will be called var. *distensum* (Kylin) below.

As for the *B. helminthosum* of Sirodot, the name was, according to the same author, used by Bory for quite another species of the genus, viz. *B. coerulescens* Sirod., and according to the rules, it is therefore to be rejected. As far as I can see there are, however, no essential differences between *B. helminthosum* Sirod. and *B. Crouanianum* Sirod. and I therefore adopt the latter name. The possibility remains that the valid name is in reality the older *B. giganteum* Desv. which is regarded as synonymous with *B. helminthosum* by De Toni (1897), but this question can hardly be decided at present.

7. *Batrachospermum Crouanianum* Sirod.

Batr. p. 244, tab. 24 fig. 1—7 (1884). Tab. III c.

Syn.: *B. helminthosum* Sirod., Batr. p. 240, tab. 22 fig. 13, tab. 26 fig. 1—7, tab. 28 fig. 1; Kylin, Stud. schw. Batr. p. 25, fig. 8.

Exs.: Wittr. et Nordst., Alg. exsicc. n. 1356 b p. p., p. p. *B. ectocarpum* Sirod.

Tufts 3—10 cm high, very mucilaginous, grey with olive or yellow tinges or brownish. Ramification rich or sparse, more or less regular, main shoots distinct, branches tapering, rarely almost cylindrical, usually much thinner than their mother axis. Whorls generally confluent, sometimes separated, ellipsoidic or barrel-shaped, 600—1000 (—1600) μ wide. — Internodia 400—800 (—1200) μ long. — Fascicles 4—6, richly branched, straight, composed of 10—20 cell-storeys, ramifying at small angles. Cells thin-walled, usually of very different shape at different levels. Proximal cells elongate cylindric, sometimes with slightly swollen ends, 6—9 (—12) μ broad, 4—10 (—16) times longer than broad, middle cells cylindric — elongate ellipsoidic or ovoid, distal cells ellipsoidic, ovoid or almost globular, somewhat broader than the middle ones. — Secondary ramuli sparse or frequent, short or finally as long as the primary ones. — Terminal hairs of varying abundance and length. — Monosporangia unknown. — Monoecious or rarely dioecious. — Antheridia terminating the ramuli or frequently the bractea, of varying abundance, globular, 5.5—6.6 μ in diam. — Carpogonial branches of varying length, arising from the fascicles or from the basal cells. Carpogonia 3—4 μ wide at the basal portion, 13—40 μ long. Trichogynes ellipsoidic, finally usually cylindric. Bractea more or less frequent but short; cells distinctly swollen. Gonimoblasts numerous: often 10 or more in each whorl, preferably located to the outer half of the whorl, sometimes exserted, globular, 70—100 (—130) μ in diam. Carposporangia ovoid, ellipsoidic or slightly pear-shaped, 8—11 μ broad, 9—13 μ long.

8. *Batrachospermum Boryanum* Sirod.

Batr. p. 246, tab. 29 fig. 1—6, tab. 30 fig. 1—5, tab. 31 fig. 1—6 (1884); Kylin p. 29, fig. 10 (1912). Tab. III d.

Exs.: Wittr. et Nordst., Alg. exsicc., n. 1006.

Tufts 1—8 (—10) cm high, very mucilaginous, grey with yellow or olive tinges or brownish. — Ramification generally very rich, more or less rich and regular; with distinct main-axes; branches tapering, thinner than their mother-axis. Whorls globular, ellipsoidic, barrel-shaped, or disc-shaped, generally, separated sometimes confluent, 600—1100 (1200) μ wide. — Internodia 500—1200 μ long. — Fascicles 3—6, richly branched, composed of 9—14 (—19) cell-storeys, ramifying at comparatively wide angles. Cells comparatively thick-walled, the proximal ones cylindrical, usually swollen at the ends, 8—14 (—20) μ broad, 20—80 (—100) μ long; the distal cells almost cylindrical or barrel-shaped, usually thinner or at least not broader than the middle ones. — Secondary ramuli finally usually frequent but not

reaching the length of the primary ones. — Terminal hairs usually rare and short. — Monosporangia unknown. — Polyecious, but unisexual specimens are more frequently met with. — Antheridia terminating the ramuli, in quantities in male plants, often more or less sparse in bisexual ones, globular or almost globular, 5.5—6.5 μ wide, 6—7.5 μ long. — Carpogonial branches arising from the fascicles or the basal cells. Carpogonia 4—6 μ wide at the basal portion, 15—30 μ long. — Trichogynes shortly club-shaped, ovoid or ellipsoidic, finally often elongate club-shaped, sometimes sickle-shaped. Bractea usually sparse and very short, consisting of almost cylindrical or slightly barrel-shaped cells. — Gonimoblasts numerous, preferably located to the outer half of the whorls, sometimes exserted, globular, 120—160 μ in diam. frequently penetrated by the bractea elongated after fertilization. — Carposporangia ellipsoidic, ovoid or pear-shaped, 8—11 μ wide, 10—14 μ long.

var. *distensum* (KYLIN) ISRAELS. n. comb. Tab. II c.

Syn.: *B. distensum* KYLIN, Stud. schwed. Batr. p. 26 fig. 9 (1912).

Distinguished from *B. Boryanum* by the shorter cells of the fascicles. The proximal cells, cylindrical and often slightly swollen at the ends, are 8—14 (—16) μ broad and 20—40 (—60) μ long, thus only 2—5 (—6) times longer than broad. Monoecious (always?).

Sect. **Hybrida** SIROD. p. 290.

Saturate green. Carpogonial branches arising from the basal cells. Trichogynes sessile or indistinctly stalked, ellipsoidical. Gonimoblasts globular, big, single (or in couple), central.

9. *Batrachospermum virgato-Decaisneanum* SIROD.

Batr., p. 290, tab. 23 fig. 1—10 (1884).

Syn.: *B. virgato-Decaisneanum* var. *cochleophilum* TEODOR. in B. B. C. 21:2 p. 206, fig. 88 (1907).

Exs.: Krypt. exsicc. 1754.

Tufts 2—8 cm high, very mucilaginous, green with a bluish tinge, ramification rich or sparse, monopodial; branches cylindrical with blunt roundish apex. Whorls separated or confluent, almost globular, ellipsoidical or barrel-shaped, 300—350 μ wide. — Internodia 300—500 μ long. — Fascicles 3, cell-storeys 6—8. Cells rather uniform, shortly cylindrical, ellipsoidical or inversely ovoid, the proximal ones 7—12 μ wide and 13—30 μ long. — Secondary ramuli more or less frequent, finally covering the internodia and reaching the length of the primary ones. — Terminal hairs frequent — sparse. — Monosporangia unknown. — Monoecious. — Antheridia globular or according to SIRODOT ovoid, terminating the ramuli at different levels, about 6 μ in diam. — Carpogonial branches inserted, at the basal cells, straight or slightly incurvate, consisting of 3—6 disc-shaped cells. Carpogonia 4—5 μ in diam. at the basal portion and 15—25 μ in

length. Trichogynes short, ellipsoidical-cylindrical, indistinctly stalked. Bractea numerous, consisting of ellipsoidical cells, of varying length. — Gonimoblasts globular or semiglobular, single or rarely in couple, centrally inserted, 100—120 μ in diam., of densely aggregated filaments composed of cells which are less than two times longer than broad. Carposporangia ellipsoidic, inversely ovoid or pear-shaped, 8—10 μ broad, 10.5—14 μ long.

Sect. **Turficola** Sirod. p. 259.

Saturate green or not so. Carpogonial branches arising from the basal cells. Trichogynes sessile or indistinctly stalked, elongate conical with the largest diameter distal. Gonimoblasts big, globular or semiglobular, single (sometimes in couple), central.

To this section Sirodot assigns just one species, *B. vagum*. Several varieties are recorded, most of which are undoubtedly nothing but modifications. Two, viz. *c. flagelliforme* and *d. affine* are, however, of considerable interest, as contrary to the others they fructificate regularly and, as far as can be concluded from Sirodot, never bear monosporangia.

Kylin divides *B. vagum* into two subspecies: *α flagelliforme* and *β keratophytum*. The former is distinguished by the frequently developed gonimoblasts, the second by the presence of monosporangia and the rare development of gonimoblasts. As to the latter, it is in Kylin's sense identical with the *B. vagum* of Roth and Agardh, the subspecies designation thus being superflous.

The position of *d. affine* must be left undecided at present; possibly it belongs to *B. vagum*. The var. *flagelliforme*, on the other hand, is so different from this species that it must seem rather mysterious that it was not created a separate species already by Sirodot. The author writes himself about »les variétés *flagelliforme* et *keratophytum*» (p. 266): »Si on n'avait à comparer que les échantillons les mieux caractérisés des diverses variétés, on pourrait s'étonner qu'elles fussent réunies dans la même espèce». However, Sirodot states that he had seen in nature all transitory forms between the two extremes. Probably in the first instance he had more superficial features in view. In the Swedish material seen it has never been possible to recognize any intermediate forms between *B. vagum* and *α flagelliforme*.

B. vagum is readily distinguished already by the vividly green colour with a bluish tinge and the pseudodichotomous tendency of ramification, and can almost always be separated with certainty from all our other species of the genus, even by the naked eye. Carpogonia occur regularly though often sparsely and antheridia are also not infrequently met with,

sometimes in abundance. Spermatia may adhere to the trichogynes but normally developed gonimoblasts, though reported by Sirodot, have so far not been observed in Sweden. Propagation is effected by monosporangia, which are usually present.

α flagelliforme, as I know it from Sweden, is quite different in general appearance and can hardly be mistaken for *B. vagum*, but it can for *B. moniliforme*, with which it largely varies parallelly. The colour may, however, but only exceptionally, be clearer green than that of *B. moniliforme*, which fact might perhaps contribute towards explaining the opinion of Sirodot.

Skuja (1938 a p. 673) has arrived at a similar conclusion as to the taxonomic value of *α flagelliforme*, and states that it is to be called *B. vogesiacum* T. G. Schultz, under which designation this interesting species will be treated in the following.

The type of ramuli is also quite different from that of *B. vagum* and in this respect, too, *B. vogesiacum* is more closely related to *B. moniliforme* (cf. also Sirodot pl. 38 fig. 12 of *B. vagum* and Pl. 36 fig. 1 and 2 of *α flagelliforme*). The cells are in *B. vagum* more ovoid and of gradually decreasing width towards the distal end of the ramuli but in *B. vogesiacum* elongatedly cylindrical, as pointed out already by Sirodot up to 8—10 times longer than broad, and of about the same width in different storeys. The older parts of the thallus do not in *B. vogesiacum* successively aquire a corneous consistence as in *B. vagum*, but periods of checked growth are often survived by basal thallus-portions of a corneous firmness and darker colour than the ordinary branches, as is also common in certain forms of *B. moniliforme* (f. *pyramidale*).

There preferably falls into the section *Turficola* a third *Batrachospermum* seen in a few vials from a couple of lakes; so far as I can see it does not correspond to any other species hitherto described. Because of the generally almost globular shape of the carposporangia I call it *B. globosporum*. It is distinguished from other species of *Batrachospermum* mainly in the comparatively loose aggregation of the branches of the more or less regularly globular gonimoblasts. On the whole the branches do not differ much from the ramuli, their proximal cells being elongate cylindrical. The colour is bright green with a bluish tinge. The trichogynes are typically elongate conical with the largest diameter distal, but may sometimes be inversely ovoid or almost cylindrical, rather similar to those of *B. virgato-Decaisneanum*, but this species has compact gonimoblasts with short-celled branches.

10. *Batrachospermum vagum* (Roth) Ag.

Disp. p. 41 (1812).

Syn.: *B. moniliforme δ vagum* Roth, Tent. Fl. Germ. 3, p. 482; *B. vagum* var. *keratophytum* (Bory) Sirod., Batr. p. 264, tab. 34 fig. 3, tab. 35 fig. 3, tab. 37 fig. 1—9, tab. 38 fig. 12—14; Kylin., Stud. schw. Batr., p. 34 fig. 13.

Exs.: Aresch., Alg. Scand. exsicc. n. 258; Wittr. et Nordst., Alg. exsicc. n. 103.

Tufts 2—12 cm high, very mucilaginous, bright green with a bluish tinge, the basal portions assuming successively a corneous consistence. Ramification more or less rich, frequently irregular, usually distinctly pseudodichotomous. Branches almost cylindrical with blunt roundish apex. — Whorls ellipsoidical or disc-shaped, only in the younger parts sometimes separated but soon confluent by the development of secondary ramuli and not distinct, 300—700 (—1000) μ in diam. — Internodia 120—360 μ in length. — Fascicles 3—4, often comparatively sparsely branched. Cell-storeys 6—12 μ. Cells pear-shaped, fusiform or ovoid, the proximal ones 7—15 μ broad and 20—60 μ long, typically of markedly decreasing width towards the distal end. — Secondary ramuli very numerous, soon reaching the length of the primary ones. — Terminal hairs of varying abundance and length. — Monosporangia generally present, single or in couple terminating the primary and secondary ramuli, ellipsoidical, 7.5—10 μ broad and 9—14 μ long. — Monoecious. — Antheridia when present often in abundance but mostly lacking, generally 2—3 together terminating the ramuli, globular, 5.5—7 μ wide, 5.5—7.5 μ long. — Carpogonial branches arising from the basal cells, straight, composed of 3—14 disc-shaped cells, often aborted. Carpogonia 5—8 μ in diam. at the basal portion, 30—60 μ in length. Trichogynes not distinctly stalked, in the shape of an inverse frustum of a cone, finally generally slightly swollen at the distal end. Bractea numerous in the distal end of the carpogonial branches, very short, composed of almost isodiametric cells. Gonimoblasts aborted. Carposporangia not seen.

11. *Batrachospermum vogesiacum* T. G. Schultz

Skuja in Arch. f. Hydrob. Suppl. 15, p. 623 (1938).

Syn.: *B. vagum* var. *flagelliforme* Sirod., Batr. p. 263, tab. 35 fig. 1—2, tab. 36 fig. 1—6, tab. 39 fig. 4; Kylin, Stud. schwed. Batr. p. 34.

Exs.: Wittr. et Nordst., Alg. exs. n. 102.

Tufts 2—10 cm high, very mucilaginous, greyish or brownish olive or pale green. — Ramification rich, monopodial, main shoots distinct, branches almost cylindrical, apex obtuse. — Whorls ellipsoidic or barrel-shaped, more or less separated or confluent, 340—700 μ in diam. — Internodia 300—500 μ in length. — Fascicles 3, richly branched; cell-storeys 6—11. Cells cylindrical—fusiform—elongate ellipsoidic, the proximal ones 5—9 μ wide and 25—60 μ long. — Secondary ramuli numerous, finally reaching the length of the primary ones. — Terminal hairs frequent. — Monosporangia

unknown. — Monoecious. — Antheridia terminating the ramuli at different levels but mainly peripherally, globular or almost globular, 5—8 μ wide and 6—8.5 μ long. — Carpogonial branches arising from the basal cells, straight, composed of 4—8 cells. Carpogonia 4—7 μ wide at the basal portion and 20—45 μ long. Trichogynes indistinctly or shortly stalked, elongate conical, finally often almost cylindrical. Bractea numerous, short. Gonimoblasts single (sometimes in couple), centrally inserted, globular, 140—280 (—330) μ in diam., their branches densely aggregated, the proximal cells pear-shaped or ovoid, 10—16 (—20) μ broad, generally 1—2 times longer than broad. — Carposporangia 8.5—13 (—17) μ broad, 13—19 (—25) μ long.

12. *Batrachospermum globosporum* Israels. n. sp.

Tab. I c-g, II b, d.

Frons ad 7 cm alta, ad 600 μ crassa, nunc laxe nunc abunde ramosa, valde mucosa, saturate viridis, leviter cyanescens. Verticilli aut distantes et ellipsoidei, aut contigui et plus minus compressi. Ramuli secundarii longi, numerosi, mox totum internodium obtegentes. Pili numerosi, plus minus elongati. Monoica. Ramuli carpogoniferi e cellulis basalibus ramulorum primariorum orientes, breves, ad 7-cellulares, curvati; carpogonia ad 40 μ longa, trichogyno indistincte pedicellato, elongato-obconico vel raro obovato vel subcylindraceo. Spermatangia globosa, 5.5—6 μ longa, 5—6 μ lata, in apicibus ramulorum primariorum et secundariorum evoluta. Gonimoblasti singuli vel rarius duo, magni, in centro verticilli inserti, globosi vel semiglobosi, laxi; ramuli gonimoblasti ramulis primariis subsimiles, cellulae basales et subbasales cylindraceae, 2 1/2—5-plo longiores quam latae. Carposporangia globosa vel subglobosa, rarius obovata, ad 13 (15) μ longa, ad 11 μ lata.

Typus: Suecia, prov. Dalarna, paroec. Folkärna, in lacu Åsgarn, 1941, G. Lohammar in Mus. Bot. Upsaliensi.

Tufts 2—7 cm high, richly mucilaginous, green with a bluish tinge. — Ramification rich or sparse, main shoots generally distinct. — Branches almost cylindrical, apex obtuse. — Central axes 45—80 μ wide; cortical threads often comparatively sparse. Whorls separated, ellipsoidic, or later confluent by the development of secondary ramuli; segments finally ovoid, pear-shaped or cylindrical, 300—600 μ in diam. — Internodia 270—475 μ in length. — Basal cells of the primary ramuli ellipsoidical or ovoid and bearing 2—3 equal fascicles, more or less richly branched; cell-storeys 6—11. Cells cylindrical, often with slightly swollen distal ends or in the distal half of the whorl ellipsoidical, inversely ovoid or slightly pear-shaped; proximal cells 6—8.5 μ wide and 20—40 μ long. — Secondary ramuli frequent, rapidly covering the internodia and finally attaining the high of the primary ones. — Terminal hairs frequent, often long. — Monosporangia unknown. — Monoecious. Antheridia frequent, terminating the ramuli at the periphery or scattered through the whorl or the bractea, approximately globular, 5—6 μ broad and 5,5—6 μ long. — Carpogonial branches arising from the

basal cells of the ramuli, frequently 2 or 3 in the same whorl, short, composed of 3—7 discoid cells, generally strongly incurvate. Carpogonia 4—6 μ wide at the basal portion and 20—30 (40) μ long. Trichogynes indistinctly or very shortly stalked, conical with the largest diameter distal, sometimes inversely ovoid or finally almost cylindrical. Bractea numerous, short. — Gonimoblasts single or frequently in couple, centrally inserted, semiglobular, 160—350 μ in diam. and 110—160 μ high. Branches loosely aggregated and not very different from the ramuli, the proximal cells being almost cylindrical, 4—7 μ wide and 2 1/2—5 times longer than broad. — Carposporangia generally almost globular or rarely inversely ovoid, 7.5—11 μ wide and 8.5—13 (15) μ long.

Sect. **Viridia** Sirod. p. 269.

Saturate green. Carpogonial branches arising from the basal cells. Trichogynes distinctly pedunculate, cylindrical. Gonimoblasts big, globular, single (rarely in couple), central.

Sirodot enumerates no less than seven species of the section, most of which were mainly distinguished merely by rather unimportant details regarding the chantransioid stages. Kylin adopts two of these species, viz. the monoecious *B. virgatum* and the dioecious *B. testale*. Apart from the distribution of the sex another difference is said to exist: »Die Karpogonäste bestehen in der Regel bei *B. virgatum* aus einer grösseren Anzahl Zellen als bei *B. testale*» (p. 36). In *B. testale* the carpogonium-bearing branches are composed of 3—6 cells, in *B. virgatum* 4—12 cells, no definite limits being thus obtained. In examining the specimens of *B. virgatum* collected by Kylin in the vicinity of Uddevalla I have not been able to detect carpogonial branches of more than 5 cells. It must be admitted that some monoecious forms have for some reason longer carpogonium axes than have ever been met with in the dioecious ones. But in distinguishing two species this trait seems to be of very questionable validity.

Already Sirodot communicates that exclusively male specimens are occasionally found in *B. virgatum*. As to the Swedish distribution, which is very characteristic, the bisexual and the unisexual forms show no fundamental differences, often occurring together in the same localities and at the same time.

In all other respects the two »species» seem quite to conform. I must therefore regard them as merely forms of one polyoecious species, for which I adopt the name *B. virgatum* Sirod. (1884). It is, however, questionable if this is the valid name. Perhaps it should be replaced by *B. julianum* (Menegh.) Archang. published in 1882. There remains,

however, also another possibility, viz. that *B. coerulescens* Sirod. (non Bory!) is not specifically distinguished from *B. virgatum*. According to Sirodot the former species is identical with *B. helminthosum* Bory (non Sirod.!).

13. *Batrachospermum virgatum* Sirod.

Batr., p. 286, tab. 49 fig. 1—9, (1884); Kylin, Stud. schw. Batr., p. 35, fig. 14 (1912).

Syn.: *B. testale* Sirod., Batr., p. 284, tab. 42 fig. 1—8; Kylin, p. 36, fig. 15 b; *B. julianum* (Menegh.) Arcang., N. Giorn. bot. ital. 14 p. 160, tab. 5 fig. 1—11 (1882)?

Tufts 2—7 cm high, more or less richly mucilaginous, green with a bluish tinge. — Ramification generally rich and regular with well accentuated main axes; branches almost cylindrical. — Central axes frequently yellowish. — Whorls globular — ellipsoidic — barrel-shaped — discoid, separated or confluent, 400—800 μ in diam. — Internodia 280—500 μ in length. — Fascicles 3; cell-storeys 8—15; richly and dilatedly branched, branches straight or somewhat incurvate. Cells cylindrical — fusiform or ellipsoidical — pear-shaped or inversely ovoid; proximal cells 6—9 μ in diam., 20—35 (—60) μ in length. — Secondary ramuli often sparse, sometimes frequent, seldom reaching the length of the primary ones. — Terminal hairs more or less frequent, generally short. — Monosporangia unknown. — Polyoecious. — Antheridia in quantities in male specimens, often sparse in bisexual plants, almost globular, 5—6 μ broad and 5—7 μ long terminating the ramuli. — Carpogonial branches arising from the basal cells, straight or slightly curvate, composed of 3—11 discoid or barrel-shaped cells. Carpogonium 4—6 μ wide at the basal portion, 25—60 μ long. Trichogynes distinctly stalked, cylindrical. Bractea frequent, very short, consisting of isodiametric cells. — Gonimoblasts single (rarely in couple), inserted centrally, globular 220—400 μ in diam.; branches densely aggregated. — Carposporangia ellipsoidical, inversely ovoid or pear-shaped, 8—12 μ broad and 12—28 μ long.

Sect. **Setacea** Sirod. p. 253.

Whorls very small. Trichogynes club- or urn-shaped. Gonimoblasts appearing as wart-like protuberances on the central axis.

To this section Sirodot assigns two species, *B. Dillenii* and *B. Gallaei*. The former is dioecious, the latter monoecious. Further, *B. Gallaei* is said to develop more frequent carpogonia and gonimoblasts in the internodia than does *B. Dillenii*. In every other respect the two species seem to be quite identical, except that the conical appearance of the segments is, according to Sirodot, more distinct in *B. Gallaei;* this, however, is hardly of fundamental importance.

As to the gonimoblasts, internodial ones are by no means so com-

mon as might be expected in the Swedish forms of *B. Gallaei*. Moreover, some specimens of *B. Dillenii* from Höör in Skåne proved to have very frequent carpogonia between the whorls. On the whole that distinctive feature seems to be of no taxonomic value at all.

In the previously discussed cases of monoecious and dioecious parallel species the opinion of their specific identity received considerable support from the evidence furnished by the ecology and Swedish distribution. Regarding the ecology there seems, likewise, to be nothing indicating any principal differences between the two species of *Setacea*, but as to the distribution the matter is far less clear.

Bisexual specimens are widely distributed all over southern Sweden, though in most districts by no means common (about 30 known localities). Unisexual plants, on the other hand, have not been recorded hitherto except from 2 localities in Skåne, both probably located to one and the same rivulet; and as far as is known they have not been collected in Sweden during the past 30 years. I have spent a good deal of time in examining the comparatively comprehensive herbarium-material brought together from the localities in question by several collectors, but so far it has not been possible to establish the presence of bisexual specimens with certainty.

One can thus hardly say that keeping the two species apart in Sweden would at present cause any special difficulties. As, however, the distribution of sex has in all other cases proved to be of no principal validity in distinguishing species, I find no reason why the *Setaceae* should not be treated in an analogous manner, and therefore unite them in one species. The species thus obtained was described from Great Britain already in 1798 by Hudson as *Conferva atra*, and was assigned to the genus *Batrachospermum* in 1841 by Harvey. The name to be retained is therefore *B. atrum* (Huds.) Harv.

14. *Batrachospermum atrum* (Huds.) Harv.

Manual p. 120 (1841).

Syn.: *Conferva atra* Huds., Fl. angl. ed. III, p. 597 (1798); *Batrachospermum Dillenii* Sirod., Batr., p. 254, tab. 20 fig. 1—4, tab. 21 fig. 1—16, (1884); Kylin, Stud. schwed. Batr. p. 32; *B. Gallaei* Sirod., Batr. p. 256, tab. 22 fig. 1—5; Kylin p. 32.

Exs.: Wittr. et Nordst., Alg. exsicc., n. 1352.

Tufts 2—5(—13) cm high, only slightly mucilaginous, which appears from the marked disinclination of the dried specimens for adherence to the paper, fresh olive or blackish green, in drying blackish or sometimes violet; the older portions sometimes (in humus-rich waters) assuming a rusty red

colour. Ramification rich and irregular. Branches almost cylindrical with tapering apex. — Central axes 60—90 μ in diam., cortical threads abundant. — Whorls small, only slightly conspicuous, ellipsoidical, 100—190 μ in diam. (main shoots). — Internodia 110—500 μ long. — Fascicles 3—4; cell-storeys 3—6. Filaments slightly branched, straight or usually curvate. Cells uniform, short cylindrical or barrel-shaped, more or less isodiametric, the proximal ones 6—10 μ broad and 8—12 μ long. — Secondary ramuli numerous, short, not reaching the length of the primary ramuli. — Terminal hairs of varying abundance and length. — Polyoecious, but bisexual specimens are (n. b. in Sweden) the rule. — Antheridia terminating the ramuli, abundant in male specimens, usually sparse in bisexual ones, globular or slightly ellipsoidic, 5.5—6.5 μ broad, 6—7.5 μ long. — Carpogonial branches usually arising from the basal cells, sometimes from the primary or secondary ramuli or from the cortical threads, short, generally consisting of 3 disc-shaped cells. Carpogonia 4—6 μ broad at the base, 15—25 μ long. Trichogynes club- or sometimes slightly urn-shaped. Bractea frequent, short. — Gonimoblasts generally single, forming wart-like or semiglobular protuberances at the central axis, in or more rarely between the whorls, 80—170 μ broad, 50—100 μ high, with densely aggregated branches. Carposporangia ellipsoidical or inversely ovoid 6—8 μ broad, 8—12 μ long.

Sirodotia Kylin.

Sirodotia was described as late as 1912 and Kylin reports only one species known exclusively from Sweden, where however it proved to be no rarity. By the recent investigations of Skuja the genus has proved to have a world-wide distribution area. Skuja (1938 b) records no less than 19 species. As far as can be concluded from the hitherto published diagnoses those species are to a great extent very closely related to each other, and distinguished by rather minute differences (cf. Skuja 1938 a), and partly they are regarded by the author himself as »Elementararten». The discovery of dioecious and polyoecious species respectively is notable, as the Swedish forms so far seem to be monoecious all through.

Of the new species, *S. fennica* — described from Karelia (Skuja 1931) — is of special interest, as it occurs within the Fennoscandian flora area. According to the author the two species *suecica* and *fennica* are distinguished mainly in the following respects: —

S. suecica is sparsely branched, the whorls are small, the internodia elongate, and the general habitus often reminds one very much of the *Setaceae* of the genus *Batrachospermum*. Terminal hairs none or very sparse and short. The cells of the ramuli relatively short.

S. fennica is richly branched, the whorls are broad (diam. up to 400 —480 μ) but the internodia short, and in habitus it approximates to the section *Viridia* of *Batrachospermum*. Hairs abundant and very long.

The cells of the ramuli are more elongate, 1.5—4 times longer than broad.

As to the ramification of the former species, KYLIN already characterizes it as »sehr reich». Especially younger specimens collected in the early summer are not infrequently very richly branched, hardly less than in *S. fennica*. The width of the whorls and the length of the internodia are subject to considerable variation. KYLIN writes (1912 p. 38) of *suecica*: »Von dieser Art gibt es gröbere und feinere Formen. Die gröberen haben in der Regel kürzere und kräftiger berindete Internodien als die feineren. Die primären Kurztriebe sind bei den ersteren etwas grösser und reicher verzweigt als bei den letzteren. Die Farbe der gröberen Formen ist mehr dunkelgrün, die der feineren mehr hellgrün. Die beiden Formen sind indessen durch Zwischenformen mit einander verbunden, und man findet nicht selten Formen, die eine vollkommene Zwischenstellung einnehmen.» Though *S. suecica* is on an average thinner than is reported for *S. fennica*, there are sometimes found forms of *S. suecica* which are not inferior to the latter in the diameter of the whorls. Broad whorls are not always connected with short internodia. KYLIN states that in *S. suecica* terminal hairs are lacking or very sparse. This is, however, by no means always the case. Specimens provided with abundant long hairs are in fact found almost as often as hairless. The occurrence of hairs seems, moreover, to be correlated in no way with the width of the whorls or the length of the internodia.

The variability mentioned will tend to diminish the differences between *S. suecica* and *S. fennica* considerably. Sometimes I have observed in Sweden forms which obviously stand nearer to *S. fennica* than to *S. suecica*. I cannot, however, find but that the standpoint of KYLIN still holds good for the Swedish forms, and that there is no reason why a subdivision skould take place. It might be emphasized that no differences seem to exist regarding ecology between the *fennica*-like forms and »*suecica* s. str.»

15. *Sirodotia suecica* KYLIN

Stud. schwed. Batr. p. 38, fig. 3, 16 (1912).

Exs.: WITTR. et NORDST., Alg. exsicc. n. 1351 a.

Tufts 2—8 cm high, moderately mucilaginous, green with a bluish tinge, the basal portions in certain waters soon getting rusty red, this colour being finally extended to the entire plant. — Ramification more or less rich; main shoots conspicuous. Branches almost cylindrical with gradually tapering apex. — Central axes 45—80 μ wide, often yellowish or brownish; cortical threads abundant. — Whorls small, ellipsoidical, separated when young,

finally generally confluent by the development of secondary ramuli; old segments pear-shaped or cylindrical; (110—) 200—300 (—500) μ in diam. (main shoots). — Internodia (180—) 300—650 (—940) μ in length. — Fascicles 3, equal, more or less richly branched. Cell-storeys (5—) 7—8 (—10). Cells comparatively uniform, cylindrical, barrel-shaped, ellipsoidical or inversely ovoid; the proximal ones 6—8 (—10) μ wide and 12—30 μ long. — Secondary ramuli frequent, finally often reaching the length of the primary ones. — Terminal hairs lacking to abundant, of varying length. — Monosporangia unknown. — Monoecious. — Antheridia globular or rarely ellipsoidic, terminating the ramuli at different levels, 5.5—6.5 μ broad and 6—7.5 μ long. — Carpogonium branches arising from the basal cells, rarely from the ramuli, short, composed of 2—5 barrel-shaped and more or less isodiametric cells, straight or somewhat curvate. Carpogonia with a semiglobular protrusion in the basal portion, 20—26 μ long. Trichogynes more or less distinctly stalked, ellipsoidical, finally cylindrical. Bractea short, composed of ellipsoidical cells. — Gonimoblasts of no definite shape, composed of irregularly branched threads, creeping among the ramuli from which the sporogenous threads arise. Carposporangia inversely ovoid to elongate pear-shaped, 6—8 μ in diam., 8—12 μ in length.

Key to the Batrachospermaceae.

a. Carpogonial base symmetrical. Gonimoblasts, if present, forming definite bodies. *Batrachospermum.*
  b. Monosporangia lacking.
    c. Whorls well-developed. Gonimoblasts globular or semiglobular (if not present cf. also *B. vagum*).
      d. Gonimoblasts small, usually numerous, scattered through the whorl.
        e. Trichogynes club- or urn-shaped. Bractea elongate, soon longer than the carpogonium.
          f. Distal ends of the ramuli straight. Monoecious.
            4. *B. moniliforme* p. 33.
          ff. Distal ends of the ramuli curvate. Polyoecious.
            6. *B. ectocarpum* p. 34.
        ee. Trichogynes ellipsoidical or ovoid. Bractea short.
          f. Proximal cells of the fascicles usually 6—9 μ broad, thin-walled. Monoecious (mainly), monosexual plants occur exceptionally. 7. *B. Crouanianum* p. 39.
          ff. Proximal cells of the fascicles usually 9—14 μ, broad, thick-walled. Polyoecious. 8. *B. Boryanum* p. 39.
      dd. Gonimoblasts big, single (rarely in couple), central.
        e. Trichogynes not or indistinctly stalked.
          f. Trichogynes ellipsoidical.
            9. *B. virgato-Decaisneanum* p. 40.
          ff. Trichogynes conical with the largest diameter distal.
            g. Saturate green. Gonimoblastic filaments loosely aggregated, their proximal cells elongate, cylindrical.
              12. *B. globosporum* p. 44.

gg. Not (or rarely?) saturate green. Gonimoblastic filaments densely aggregated, their proximal cells short, pear-shaped or ovoid. 11. *B. vogesiacum* p. 43.

ee. Trichogynes distinctly stalked, cylindrical. 13. *B. virgatum* p. 46.

cc. Whorls little developed, Gonimoblasts forming wart-like protuberances at the central-axis. 14. *B. atrum* p. 47.

bb. Monosporangia present.

c. Bright green. Trichogynes conical with the largest diam. distal. 10. *B. vagum* p. 43.

cc. Not bright green. Trichogynes club- or urn-shaped. 5. *B. sporulans* p. 34.

aa. Carpogonial base with a semiglobular protrusion. Gonimoblasts not concentrated into definite bodies. 15. *Sirodotia suecica* p. 49.

Genus artificiale.

Pseudochantransia Brand.

Thallus typically composed of a prostrate system of irregularly branched creeping threads often forming a thin, compact, sometimes extensive crust, and of an erect system of upright filaments branched more or less frequently and irregularly. Propagation effected by monosporangia terminating branches of the creeping threads or more frequently few-celled branchlets of the upright filaments. Sexual propagation unknown.

The genus comprises partly forms that are protonemal stages of undefined species of *Batrachospermum*, partly almost certainly independent species.

It might be of some interest at the outset to review briefly Sirodot's theory of the Chantransioids. This author distinguishes two types of chantransioid forms with the power of developing *Batrachospermum*-shoots. The first, the »prothalle», is small and consists mainly of irregularly branched, interweaving filaments creeping on the substratum. From these filaments short, unbranched, upright filaments may arise. The second type, the »forme asexuée» (i. e. of the respective *Batrachospermum*-species) shows the same plan of organisation: the upright system is, however, far better developed, its filaments being longer, branched and accumulated to dense tufts or extensive carpetings. Between the »asexual forms» and the *Batrachospermum*-plants there exists a regular »alternation of generations», not to be confounded of course with the alternation of haploid and diploid generations. Such regular alternation does not exist between the »prothalle» and *Batrachospermum*, though the sexual plants may also be developed from these simpler chantransioid forms.

This idea was not in every respect confirmed by the experience of other authors. Already SIRODOT admits that the »asexual forms» were able to vegetate for long periods independently. HEMPEL had Chantransioids of the type in question under observation for 4 years, but was never able to discover any metamorphoses.

BRAND found the classification of SIRODOT to be artificial. According to him no fundamental differences exist between the two types under consideration. Primarily a basal disc constituted by creeping filaments is formed. From this disc *Batrachospermum*-plants can directly develop. If, however, the circumstances are not suitable, erect chantransioid filaments grow out instead, these filaments being able to continue their growth for years. On a possible improvement of the environmental conditions, *Batrachospermum*-plants may also be developed from the erect filaments.

Though several facts speak in favour of BRAND's opinion, the »prothalle» in SIRODOT's sense will be of a certain interest, as there are wide areas where these are of very frequent occurrence, whereas the »asexual forms» are rarely met with.

To the section *Batrachospermi* of his »genus artificiale» BRAND assigns two European »species», both of which were originally described as *Chantransia*-species.

The diagnoses run as follows.

Ps. chalybaea: Filis 8—11 μ crassis, ut plurimum plus-minus chalybaeis, apicibus obtusis.

Ps. pygmaea: Filis ut plurimum 11—15 μ crassis, sordide viridibus, apicibus obtusis; cellulis subbrevibus.

Ps. chalybaea forms penicillate tufts of bluish or greyish green colour. The cells are comparatively long, in the main filaments 3—7 times longer than broad, and thin-walled. The apical cells are usually rounded at the apex, and terminal hairs occur only rarely.

Ps. pygmaea, on the other hand, has the shape of semiglobular or somewhat flattened cushions of a tough consistence and is never bright green but brownish or dirty dark-green. The cells are short, in the main filaments up to 3 times longer than broad, and more thick-walled. The terminal cells are more frequently acuminate and hair-bearing.

The two »species» are thus clearly distinguished when typically developed and keeping them apart is usually easy enough, though intermediate forms more difficult to interpret may sometimes occur.

Ps. chalybaea as well as *Ps. pygmaea* are sometimes found with single branchlets transforming themselves into *Batrachospermum*-shoots; the

former, however, more seldom than the latter. The establishing of the specific identity of Chantransioids with definite *Batrachospermum*-species is, however, bound up with considerable difficulties. Firstly, several *Batrachospermum*-species (at least up to 5) and also several *Pseudochantransia*-forms may occur at the same time in the same locality. Secondly, the young *Batrachospermum*-shoots visibly resulting from a metamorphosis of a *Pseudochantransia*-branchlet are generally too little differentiated to make a certain determination of the species possible. And when the former has become more developed, the downward-growing cortical filaments fixing the plant to the substratum have reached such an extent that the possible connections with a Chantransioid are effectively hidden. From mere cohabitation no certain conclusions are allowed. I once observed on *Fontinalis* in a river thick coats of *P. chalybaea*. Numerous small plants of *Batrachospermum sporulans* were growing out directly from these. The microscopical investigation showed, however, no transformations of the chantransioid branches. On the whole nothing suggesting any very intimate relations between the two algae was obtained.

Several authors have communicated more specific reports on connections between *Pseudochantransia* and *Batrachospermum*. Skuja (1934) advances the fairly likely hypothesis that the colour of the chantransioid stages approximates to that of the corresponding *Batrachospermum*-plant. On the whole, as some *Pseudochantransiae* are very easily distinguishable, it would seem very strange if they were distributed quite irregularly among different sections of *Batrachospermum*.

From this point of view too, numerous reports of Sirodot, who figures the asexual stages of most *Batrachospermum*-species, often appear somewhat contradictory. He assigns to the green *Ps. chalybaea* the chantransioid stages of a number of species, both green and not green, belonging to several sections of the genus. And in the well-limited section *Helminthoidea* both *Ps. chalybaea* and *Ps. pygmaea* are said to occur as chantransioids. The inevitable impression of these statements is that the conditions vary quite irregularly. It is, however, much more probable that Sirodot has repeatedly been confused. This is at least established in one case, viz. when, as Budde already emphasizes, he states that *Chantransia ramellosa* (= *Ch. Hermanni*) is the asexual form of *B. helminthosum*, which statement has caused much confusion in the phycological literature.

Budde (1933) states that *Ps. chalybaea* is included in the life-history of *B. arcuatum*, and figures a metamorphosing branchlet.

On the whole, with regard to the present state of the Chantransioid-

taxonomy we must proceed with the greatest caution in drawing conclusions about the connections between specifically named *Pseudochantransiae* and *Batrachospermum*-species.

From the occurrence of certain Chantransioids some authors have drawn conclusions about the *Batrachospermum*-species of which it is supposed to be a stage. Such statements should be avoided, all the more as the possibility of the existence of independent species morphologically very similar to *Pseudochantransia Batrachospermi* can hardly be denied.

Budde's (1933) supposition of the presence of *B. vagum* is founded on the presence of a *Pseudochantransia*, which is not especially characterized. Though I have seen *B. vagum* more or less richly developed in numerous localities I have never succeeded in obtaining any Chantransioids of the types with upright filaments growing together with it. It seems that the latter have quite other ecological demands than *B. vagum* has.

Skuja (1937) communicates a *Pseudochantransia* with the following comments: »Den Merkmalen nach steht die Form *Ps. pygmaea* (Kütz.) Brand nahe; es handelt sich dementsprechend um eine Art aus dem Verwandschaftskreise von *B. moniliforme* Roth oder *B. densum* Sirod.» This does not, however, harmonize with the experiences obtained in Sweden. In the districts of the *B. densum*-like forms the Chantransioids are represented almost entirely by »prothalloid» forms. Typically developed *Ps. pygmaea* is far less common than *B. moniliforme*, and does not show the same distribution as that species; but is remarkably often found together with *B. Boryanum*, with which it is in several cases probably organically connected. It must be said to be concentrated to the Silurian limestone districts such as those of southern Skåne, Dalarna and Jämtland, where it often plays a considerable quantitative part in the vegetation.

It should also be noticed that it has not been recorded from the limestone island of Gotland, where *B. Boryanum* is also lacking. On the other hand the distributional conformity is by no means complete, as *Ps. pygmaea* is not infrequently found for instance in Uppland, where no members of the section *Helminthoidea* have so far been met with.

As to the distribution of *Ps. chalybaea*, a distinct quantitative preponderance is evident in the south-eastern districts of Middle Sweden as shown by figure 10. In a few cases metamorphoses have been seen leaving little doubt as to its character as a stage of *B. virgatum*. On comparison of the two distribution maps (fig. 8 and 4 respectively) a similar tendency is apparent, though *Ps. chalybaea* also occurs in the south-western districts situated definitely outside those of *B. virgatum*.

No explanations of this behaviour can be given except that the Chantransioid in question is not uniform.

I must agree with Skuja (1934) that definite clarity in the questions considering the group called *Pseudochantransia Batrachospermi* can hardly be expected without experimental investigations.

I therefore prefer, at present, to retain the old names *Ps. chalybaea* and *Ps. pygmaea*, as designations for morphologically characterized though certainly not taxonomically uniform populations of Chantransioids.

Chantransioid stages of *Sirodotia (fennica)* have been described by Skuja (1931). They seem to be well distinguished by the bluish green colour, the thin filaments, 5.5—9 μ in diam., and the comparatively short cells, 1 ½—3 times longer than broad. So far they have not been met with in Sweden with certainity, but they may occur.

The chantransioid stages of *Lemanea* are also easy to distinguish by their broad cells, 15—25 μ in diam. The entire absence of monosporangia constitutes a further characteristic.

In all cases discussed the character of stages of other Florideae must be regarded as more or less established. As already mentioned, there remains a no small group of Chantransioids where that is by no means the case.

Sirodot already observed that well developed *Pseudochantransiae Batrachospermi* were able to grow in rivers for years without ever developing *Batrachospermum*-shoots, and this observation has been confirmed by the reports of several other authors. Moreover Chantransioids have been found at considerable depth in lakes. On the other hand sexual shoots of *Batrachospermum* occur only in shallow water. It must therefore be supposed that those deepwater forms at least are able to grow independently in lakes for hundreds or even thousands of years. From this to a quite »emancipated» Chantransioid there seems to be a fairly small step of evolution. The possibility of the existence of secondarily independent Chantransioids can hardly be denied and this may be one way of the origin of such species.

A group of broad-celled forms which in other respects show an apparent conformity with *Ps. chalybaea* should be considered in this connection. The North-American *Ps. macrospora* (Wood) Brand as well as the South-American *Ch. chalybaea* var. *brasiliensis* Nordst. belong here. Recently Skuja (1938 a) has described a couple of unnamed forms from Java and Sumatra which are regarded by the author as stages of *Batrachospermum*-species, though no metamorphoses are reported. In a couple of rivers in southern Skåne I have discovered another interesting form. No budding into *Batrachospermum*-shoots was observed, and no

Batrachospermum or other Floridea which might possibly be put into connection with it. This may, of course, be due to a mere accident, as even in the true *Pseudochantransiae Batrachospermi* the metamorphoses are relatively rarely met with, especially in summer when the records in question were made. Of great interest is another fact, viz. that, as far as is known, there does not exist in Sweden any other Floridea which shows even approximately the same distribution except *B. virgato-Decaisneanum*, which can hardly be taken into consideration because of its quite different ecology. In any case there can be no doubt that the Chantransioid in question represents a distinct species well distinguished from *Ps. chalybaea*, as could be seen in the river Kävlingeån in the vicinity of Lund, where the two forms occurred together. In searching for a name I have decided to call it *Ps. Leibleinii* (Kütz.) n. comb. This Chantransioid was originally described by Kützing and figured in his Tabulae phycologicae under the name *Chantransia Leibleinii*. Rabenhorst changed its range into a variety of *Ps. chalybaea* and Brand regarded it as a synonym of that species. Unfortunately I have not seen the original diagnosis of Kützing, but in Pascher (1925) var. *Leiblenii* is described in the following manner: »Fäden zu halbkugeligen, violett-stahlblauen Büscheln vereinigt, reich verzweigt. Zellen 13—16 μ dick, an der Basis der Fäden 3—4 mal so lang als dick, an den Spitzen kürzer. Vorkommen wie bei der Hauptart.» According to the original figures and the diagnosis of Rabenhorst the ramification is less rich but this may be of less importance. In all essentials the Swedish forms seem to be conform to *Ch. Leibleinii*, though slightly broader filaments have also been measured and the terminal cells are often longer.

By the kindness of Fil. mag. Tage Borgh I have received for investigation a vial containing a very peculiar alga growing on mud in a lake in Jämtland. As such conditions of environment have hitherto not been reported for the freshwater Florideae generally I was astonished to find that it was undoubtedly a Chantransioid, the plastids being bluish-green, changing to bluish-violet when preserved. Concerning the dimensions, the form in question reminds one of *Lemanea* status chantransioides, and on the whole no monosporangia or propagative bodies were observed. By the branches ramifying at an angle of almost 90° it departs from the definite *Pseudochantransia*-concept. In 1938 I had the opportunity of visiting the locality under the guiding of T. Borgh, and the alga was then refound. The locality was a small mountain lake surrounded by bogs and with no affluents or but very minute ones. *Batrachospermum moniliforme* was observed in the outflow but no other Florideae could be obtained. The Chantransioid which is described as

Ps. serpens n. sp. formed a very loose carpeting on the soft bottom at about 2 m depth.

Among the deep water Chantransioids *Ps. chalybaea* var. *profunda* described by Zimmermann (1928) from Lake Constance has a special interest, as it has also been recorded by Stålberg (1939) from Lake Vättern in Sweden. Specimens from the latter locality have not been seen, but as to the form of Zimmermann, it can hardly be doubted, to judge from the description and the figures, that it constitutes a separate type probably not very closely related to *Ps. chalybaea*, from which it differs by the very short cells among other things.

Finally '*Chantransia*' *incrustans* Hansg. might be briefly considered as it has been mentioned (by Kann 1941) in connection with a chantransioid observed by Simmons (1898) in Skåne. It is very likely that this form constitutes another independent type. It has been found in the littoral zones of lakes and has an apparent incrustation of lime. Kann supposes that the likewise incrusted form of Simmons might belong to *Ch. incrustans*. It should, however, be noticed that incrustation of lime cannot be used as a distinctive feature of taxonomical importance, as it occasionally occurs in many algae, both Florideae and others, and evidently depends upon certain conditions of environment. It now appears that an often very strong precipitation of lime frequently takes place in the cushions of *Ps. pygmaea* in rivulets in Skåne and it is most probable that Simmon's form belongs to that »species». In any case, *Ch. incrustans* has not been met with hitherto in Sweden.

16. *Pseudochantransia chalybaea* (Roth) Brand

Hedwigia 49 p. 118 (1909).

Syn.: *Conferva chalybaea* Roth. Cat bot. 3 p. 286, tab. 8 fig. 2 (1806), *Trentepohlia pulchella* β *chalybaea* Ag., Syst. p. 37 (1824); *Tr. aeruginosa* Ag.. Syst. p. 38 (1824)? *Chantransia chalybaea* (Roth) Fries, Plant. homon. p. 338 (1825); Kütz., Tab. phyc. 5 tab. 41 fig. I a—e.

Exs.: Wittr. et Nordst., Alg. exsicc. n. 304 p. p., p. p. *Chantransia Hermanni*).

Tufts penicillate, solitary or united into extensive carpetings, 2—5 (—) mm high, bright green with a bluish tinge or greyish green, in dull light sometimes darker and more brownish. Ramification more or less rich, irregular, alternate or opposed, sometimes unilateral in series; branches mostly adpressed and frequently reaching the heigth of the main filaments. — Main filaments more or less inconspicuous; cells (6—) 8—12 (—13) μ in diam., 30—80 μ in length, 3—7 times longer than broad. Terminal cells with rounded, rarely acuminate apex. — Cells uninucleate, with a parietal plastid, often dissected into spirally arranged ribbons; walls thin, 0.8—1.3 (1.8) μ.

— Terminal hairs generally lacking, rarely abundant. — Monosporangia abundant or sparse, sometimes lacking, 1—2 together terminating branchlets consisting of generally 4—7 cells, unequally distributed, often accumulated to certain levels, almost globular — ellipsoidic, (7.5—) 8—11 μ in diam. and 9—12 (13) μ in length. — Metamorphoses into *Batrachospermum*-plants occur, but only rarely.

var. *profunda* Zimmerm.

Zeitschr. Bot. 20, p. 27, fig. 4, tab. 1 fig. g, h, tab. 2, fig. g (1928).

Thallus consisting of branched prostrate filaments, rarely with upright 3—6-celled branches. Monosporangia as a rule on the upright filaments, mostly single, 13 μ in diam. Cells 6—8 μ broad, 11—15 μ long. Plastids greyish green with a bluish tinge.

(Diagnosis according to Zimmermann; Swedish specimens not seen.)

17. *Pseudochantransia Leibleinii* (Kütz.) Israels. n. comb.

Tab. I a.

Syn.: *Chantransia Leibleinii* Kütz., Phyc. germ. p. 229 (1845); Tab. phycl. 5, tab. 42 fig. 2 a—d; *Ps. chalybaea* var. *Leibleinii* (Kütz.) Rab., Krypt.-Fl. 2 p. 115 (1847).

Tufts solitary or united into coherent carpetings, 3—8 mm high, comparatively stiff, brownish violet (n. b. in dull light). in drying almost black. — Ramification more or less rich, irregular, alternate or sometimes opposed, now and then unilateral in series; branches mostly adpressed and frequently reaching the height of the main filaments. — Main filaments more or less inconspicuous; cells 13—18.5 μ in diam. and 45—85 μ in length, 3—5 times longer than broad. Terminal cells rounded, sometimes slightly swollen at the apex; hairs none. — Cells uninucleate with a parietal plastid, often dissected in spirally arranged ribbons, pyrenoids lacking, walls comparatively thick, 1.7—1.9 μ broad. — Monosporangia abundant — sparse, single (rarely 2 together) terminating branchlets consisting of 1—4 cells, ellipsoidical — almost cylindrical, 12—18 μ in diam., 18—24 μ in length. — Metamorphoses into *Batrachospermum*-plants have not been observed.

18. *Pseudochantransia pygmaea* (Kütz.) Brand

Hedwigia 49, p. 118 (1909).

Syn.: *Chantransia pygmaea* Kütz., Phyc. germ., p. 285 (1845); Tab. phyc. 5, tab. 45 fig. 2 a—c.

Upright filaments forming semiglobular or often somewhat flattened cushions of tough consistence, often fusing into extensive crusts. Cushions 1—2 mm high, olivaceous, brownish olivaceous or dark green, in drying usually reddening, composed of closely aggregated filaments, now and then incrusted with lime (in calcareous water). Ramification more or less sparse, very irregular, alternate or sometimes opposed; branches often depressed

and frequently reaching the height of the main filaments. Main filaments more or less inconspicuous; cells 10—12 (—14) μ wide, 11—30 (—40) μ long, 1—3 times longer than wide. Terminal cells with rounded or sometimes slightly attenuate apex. — Hairs lacking or present. — Cells uninucleate with a parietal plastid, often dissected in irregular discs; pyrenoids none; walls comparatively thick: 1.5—2 μ — Monosporangia abundant — sparse, 1—2 together terminating unequally distributed branchlets, generally consisting of 3—6 cells, almost globular or roundish ellipsoidic, 9—11 μ thick and 10—13 μ long. — Metamorphoses are not infrequently observed.

19. *Pseudochantransia serpens* Israels. n. sp.

Tab. I b.

Filia recta, cyanescenti-viridia, irregulariter ramosa, ad septa non constricta, ramis plerumque sub angulo subrecto egredientibus. Cellulae 16—18 μ latae, 30—60 (—90) μ longae.

Propagatio ignota.

Typus: Suecia: Jämtland, paroec. Hällesjö, in lacu Våntjärn, 1938, T. Borgh et G. Israelson in Mus. Bot. Upsaliensi.

Forming a loose, cobweb-like coat on mud, consisting of non-adherent up to 5 mm long, straight, very irregularly branched, bluish green filaments, ramifying at an angle of almost 90°. — Cells cylindrical, 16—18 μ in diam., 30—60 (—90) μ in length. — Apical cells with rounded apex. — Hairs not seen. — Monosporangia and methods of propagation on the whole unknown. The old portions of the filaments disintegrate successively. — Cells with a single, central nucleus, plastids parietal, often dissected into irregularly spiral-shaped ribbons.

Key to the Chantransioids.

Only forms with well-developed upright system are considered. The forms often met with in streams, and mainly composed of a prostrate system, possibly with only solitary, short and few-branched erect filaments, are not clarified, but they will be for the most part stages of other Florideae. For deep-water forms from lakes cf. *Pseudochantransia chalybaea* var. *profunda* p. 58.

a. Plants bright red, forming penicillate tufts.
Chantransia Hermanni p. 15.

aa. Plants of varying colour but never bright red.
b. Ramifying at angles less than 45°, branches frequently adpresse.
c. Main filaments 13—25 μ in diam.
d. Monogonidia present. *Pseudochantransia Leibleinii* p. 58.
dd. Monogonidia none. *Lemanea* status chantransioides p. 20.
cc. Main filaments up to 12 (—14) μ in diam.
d. Cells of the main filaments 1—3 times longer than broad.
e. Olive, brownish-olive, or dark green tough cushions. Main filaments 10—12 (—14) μ in diam.
Pseudochantransia pygmaea p. 18.

[ee. Bluish green tufts, main filaments 5.5—9 μ in diam.
Sirodotia status chantransioides p. 55.
Note. Not established in Sweden but may occur.]
dd. Cells 3—7 times longer than broad. Forming penicillate tufts, bright green with a bluish tinge or greyish-green.
Pseudochantransia chalybaea p. 57.
bb. Ramifying at angles of almost 90°. *Pseudochantransia serpens* p. 59.

Genus incertae sedis.

Hildenbrandia Nardo.

20. *Hildenbrandia rivularis* (Liebm.) J. Ag.

Sp. II p. 495 (1863); Skuja, Act. Univ. Latv. 14 p. 659 (1926); Fritsch, New Phytol. 28 p. 167, fig. 1, tab. 5 fig. 3 (1929); Geitler, Arch. Prot. 76 p. 581, fig. 1—5 (1932); Skuja, Arch. Hydrob., Suppl. 15 p. 626, tab. 34 fig. 1—9 (1938 a).

Syn.: *Erythroclathrus rivularis* Liebm., Kröy. Tidskr. p. 174 (1839).

Thallus bright crimson, forming more or less regularly circular discs, attaining a diam. of about 2.5 cm but neighbouring discs often fusing into extensive crusts. Discs usually about 50—100 μ thick, consisting of a basal layer composed of radiating rows of somewhat elongate cells and densely aggregated, simple or more rarely dichotomising upright filaments of almost isodiametric cells, usually 7—10 (15) in number and 4—12 μ broad.

PART II.

Ecology and distribution.

Physical conditions.

The freshwater Florideae show a decided predilection for running water. It is true that a couple of rare forms are known only from lakes, but for the rest very few species occur with any regularity in lakes, and in smaller bodies of stagnant water the group is mostly entirely lacking. Half of our species have been found exclusively in rivers and brooks, and even in running water a marked differentiation is perceivable. The lenitic habitats are avoided, which is hardly astonishing in view of the variable conditions of sedimentation and the consequent instability of the substratum, which make them less suitable for attached algae on the whole. The proper habitat of the Florideae in fresh water is the lotic stream-biotopes, and there they are seldom sought in vain. Several species often live together, sometimes up to seven, and in the alga vegetation covering the bottom stones their quantitative part may be considerable.

In the cases where Florideae occur in lakes they are usually confined to shallow and littoral positions with more regular circulation of water *Hildenbrandia rivularis* and the deep-water Chantransioids, however, may descend to a depth reaching several tens of metres.

Some authors state that certain species occur only in brooks, but this should not be interpreted as indicating any fundamental avoidance of larger streams. *Batrachospermum ectocarpum* and *B. virgatum*, for instance, are actually restricted in some districts, e. g. southern Dalarna, to smaller streams, but in Uppland they live in rivers too, and it is most probable in this case that the water chemistry is the deciding factor. On the whole, the size of the stream seems in itself to be of no importance. Intermittent streams such as mere rain-water brooks cannot, however, be taken into consideration as habitats.

Except for *Lemanea fluviatilis*, which is not infrequently found in industrially regulated water-courses on rocks and dams above the water-

line at periodical alterations of the water-level, the zones laid bare at summer low-water are definitely avoided. More occasional drying up, such as at periods of exceptional low-water, may, on the other hand, cause only a temporary disappearance of the plants, so that it is probable that the prostrate chantransioid system is a little more resistant.

Chantransia Hermanni and *Lemanea* spp. are real torrenticols and differ from other species in definitely avoiding more sluggish positions. *Sirodotia* and *Pseudochantransia chalybaea* are likewise frequently met with in torrents, but particularly for the latter the range is very wide. The vast majority of the freshwater Florideae avoid the extremely exposed habitats, but below a rather high upper limit they seem to be fairly indifferent as to the velocity of current.

The commonest substratum is rocks and stones, but various other firm bodies, inorganic or organic, may be used by most species, and, except for *Hildenbrandia*, epiphytical occurrence as on mosses or algae in flowing water or higher water-plants in lakes is not uncommon.

Like their marine relatives, the algae under consideration are able to manage with rather small amounts of light as compared with the green algae for instance. As for the non-red forms, such as the Batrachospermaceae, the frequent occurrence in shallow situations in localities directly exposed to sunlight indicates that the light-range is very wide; when the plants are actually more frequently developed in slightly shady habitats, such as under bridges and overhanging trees or shrubs, this fact is probably connected with the reduced competition with more light-demanding plants there. The red *Hildenbrandia* is most moderate in its demands for light and shady surfaces are its main haunts. On the whole this alga is often the extreme outpost of the macroscopic vegetation as regards little light. In sun-exposed localities it is seldom to be seen on the upper-sides but should be sought on the under-sides of stones and boulders. The other red species, *Chantransia Hermanni*, behaves somewhat differently and is frequently met with in habitats strongly exposed to light even in highly transparent water. On the other hand, if sparsely represented, it is usually confined to shady positions.

Within wide limits, the conditions of temperature seem to be not very important for the occurrence, as most species live both in cold and warm water. Some facts, such as the periodicity, indicate, that the temperatures during the height of the summer in our »summer-warm» brooks and rivers are less suitable for growth.

Chemical conditions.

As to the demands of the freshwater Florideae upon the water chemistry their preference for »clean» water has often been emphasized. In the saprobic system of Kolkwitz (1935) the red algae are met with mainly within the catharobic and oligosaprobic, but also the β-mesosaprobic series. The α-mesosaprobic and polysaprobic ones with water more or less strongly polluted by organic matter from common sewers or factories are strictly avoided. This is no doubt of general validity (cf. however the communication in Budde 1930 that a *Batrachospermum*-form lives together with *Sphaerotilus* in the river Ruhr). The statements of some authors, on the other hand, that the Florideae only occur in »clear» water can by no means be generalized. Lowland rivers with water made highly turbid by clay, and brown, polyhumous waters often harbour a Floridean flora which is in many cases far richer than that of mountain brooks with very transparent water.

Concerning the more special requirements very little is known. The importance of the particular ions and to what extent their concentrations may be decisive for the occurrence of freshwater algae form complicated problems demanding special researches. Lime has long been paid attention to, and in literature there are numerous statements about lime-loving and lime-avoiding species. It has further become customary nowadays in alga floras also to mention the pH-amplitude of the species. Iron concentration is another factor stated to be of great importance in some cases etc. With modern though not always very well defined terms some authors, usually referring to greater and smaller demands respectively on the nutritive resources of the whole, have spoken of »eutrophic» and »oligotrophic» species. As to the Florideae, the rather few statements existing are as a rule either very vague or of merely local validity.

By an inventory as extensive as possible of the stream-alga flora of Swedish freshwaters, chemically already more or less well known by the publications of previous authors, I have tried to bring together a comparative material calculated to throw some light upon the problems in question. In doing so, there are chiefly two works which have served as bases, viz. those of Lohammar (1939) and Eriksson (1929).

Mainly for the purpose of comparison with the higher water vegetation, Lohammar investigated a great number of lakes from two different districts, the southern of which is situated entirely within the boundaries of »Middle Sweden», viz. in southern Dalarna and Uppland. The northern district comprises the eastern parts of northern Lapland (Västerbotten,

Norrbotten and the easternmost parts of Torne Lappmark). The water samples were collected in the years 1929—1937, and originate from just under the water surface mostly more or less close to the middle of the lakes. From each lake there are samples from a few occasions at different seasons though mainly during the period of vegetation. The samples were not filtered before the analyses, which in most cases are rather detailed. For about 40 lakes the algaflora of the outflow has been investigated by me at rapidly flowing parts as close to the very outlet as possible. These investigations were carried out 1932—1942. A few reports on finds of Florideae in the lakes themselves have also been taken into consideration.

It might be questioned to what extent the analytical results obtained from the surface water of a lake are applicable to the water of the outlet of the same lake. As Eriksson (p. 49) emphasizes, the amount of dissolved inorganic matter in a river generally decreases while passing a lake, considerably so in large lakes, this evidently being due to precipitation. However, the water-chemical conformity between adjacent links in the same chain of lakes, which is repeatedly established by Lohammar, speaks for extending the conformity to the connecting stream too. Provided there are no special affluents present, such as heavy springs close to the outlet, there seems to be every reason in this case to suppose that the differences are as a rule not very important. An exception may be made for dissolved gases and factors markedly influenced by their concentration. It is known that in water subjected to aeration in rapids and water-falls the pH values tend to rise, and it is probable that the reaction is more uniform in fast-flowing streams than in stagnant waters.

Eriksson's work comprehends an extensive analytic material from rivers and brooks in most parts of Sweden, brought together by the Meteorologico-Hydrographical Office of the Swedish State. From every station there were analysed filtered water samples regularly collected 1909—1925 every other or in some cases every month during a series of years (from 2 up to 17). The analyses comprise a rather limited number of factors. On the other hand they give a clearer view of the temporal variation and more trustworthy average values. Algological investigations have been carried out 1932—1941 in about 30 rivers and at the same stations as those where the water samples for the chemical analyses were collected, if the conditions of current were suitable there. If not, I have chosen a locality usually somewhat downstream, in a couple of cases upstream. As a rule practically no differences between

the water of the two sample-stations, the chemical and the algological, can be expected,

For details concerning the chemistry the reader is referred to the original works cited. We here confine ourselves to a brief summary of some general results based on average values of the analyses.

The total and the combustion residues are subject to a considerable variation in the present material, for the latter from about 10 up to more than 200 mg/l. According to Lohammar, the specific conductivity follows the combustion residue rather closely. The numerical value of the former ($\varkappa_{20} \cdot 10^6$) is at high and medium contents of salts approximately double that of the latter in mg/l, but at low contents lower.

On the whole most factors show a far-reaching parallellism to the combustion residue. This is the case with calcium and potassium, and also sodium, magnesia, strontium, chloride, sulphate as well as pH.

The total amount of phosphorus shows a tendency to be larger in waters rich in electrolytes, and the same is true of the total amount of nitrogen. Considering the very conspicuous variation, the average values must be particularly uncertain in both cases.

The iron content varies very irregularly, though lakes poor in electrolytes often have more dissolved iron than those rich in electrolytes. The temporal variation is considerable, so that the average values are not very certain. The manganese varies still more irregularly than does the iron, though water rich in iron usually also contains much manganese.

It has proved suitable from different points of view to treat the material obtained from each of the authors mentioned separately, and in the following the localities of Lohammar form »Series L» and those of Eriksson »Series E». In both series the elements are ranged according to increasing mineral content of the water. This basis has been chosen to facilitate the comparison between the two series, as the conductivity has not been tested in Series E.

The qualitative results of the Floridean inventory appear from the diagrams (Supplement). The frequency has not been taken into consideration, as it is often subject to seasonal and annual variations. A complete list of the localities referred to in the diagrams is given in Appendix 1.

If we first consider Series L, a division into two groups, a and b, has been made, the latter comprising the rivers and brooks from the Silurian limestone districts at Lake Siljan in Dalarna. From both chemical and floristical points of view these form a natural group. Chemically they are characterized by a high percentage of calcium (about

40 % or more of the total combustion residue). The pH-values are, likewise, comparatively high. Furthermore the percentages of potassium, sodium, magnesia, sulphate, phosphorus, and nitrogen are comparatively low, and that of iron very low. Floristically these waters are characterized negatively by the lack of all species usually characteristic of waters rich in electrolytes, and positively by the presence of *Batrachospermum Boryanum*.

The streams in Upper Norrland, on the other hand, though geographically fairly distant from those of Middle Sweden, seem to form a very natural series with the latter, so that there seems to be no reason why they should not be ranged together with them.

An investigation of the relations between the Floridean flora and the separate chemical factors shows that by far the best correlation with the flora is obtained by comparison with the combustion residue, the conductivity, or other factors varying parallel with these. In diagram a there is a definite limit at a combustion residue of about 30 mg/l. *Hildenbrandia*, *Batrachospermum ectocarpum*, *B. virgatum*, and *B. atrum* are found exclusively to the right of the limit, while *Sirodotia*, *Batrachospermum vagum*, and *B. moniliforme* f. *pyramidale* occur only to the left of it.

In spite of frequent changes in the order of the special localities, essentially the same distribution is obtained, if the localities are ranged according to increasing amounts of the other factors mentioned above, that vary parallell to the combustion residue, but of these only calcium has been taken into consideration in the diagrams.

According to Lohammar, the hydrogen-ion concentration does not play any very fundamental part in the distribution of higher water-plants within the lake series. Moreover, the validity for the outlets of the lake-values is somewhat uncertain. However, for the pH-averages, the ranges obtained from the present material are 5.5—7.1 in the group *Sirodotia suecica* and *Batrachospermum vagum* and 7.0—8.0 in the group *Hildenbrandia rivularis*, *Batrachospermum ectocarpum*, *B. virgatum*, and *B. Gallaei*.

Phosphorus and nitrogen give a distribution of species similar to that of the combustion residue, though there are in both cases a few overlappings. The former is of special interest in this connection, as this factor is suspected by Lohammar to occupy a key position in the production of higher water plants. An especial importance of phosphorus for the qualitative composition of the Floridea-flora is, however, not perceptible from the present material.

As for iron (see also the diagrams) and manganese, there are, likewise, no indications that these factors are of any decisive importance in the usually occurring total percentages.

Passing now to Series E, we find that the main features of the diagram show a very good agreement with Series L. The distribution of species is essentially of the same type. The limit between the more and the less »demanding» species is, however, not so distinct, as the combustion residue ranges of the two groups overlap a little. Instead of a change-»point» at about 30 mg/l as in the former series, we get a change-zone at about 40—45 mg/l. Regarding the numerical difference, it should not be forgotten that the analysis figures of Series E are average values for the year, while those of Series L are based upon a few samples collected mainly during the vegetation period. According to Eriksson the content of minerals often shows a maximum in winter, especially in Norrland, so that it seems probable that the figures of Series L should be increased a little to be comparable with those of Series E. Different analytical methods in the two series may perhaps also contribute in explaining the difference.

The evidence furnished by streams changing their electrolyte standard during their courses is of special interest in this connection. Fundamentally this case is very frequently realized. Most rivers and brooks in Sweden have their sources in districts with soils poor in lime, and consequently bear water containing rather small amounts of dissolved salts. During the lower parts of their courses they often pass more or less extensive cultivated plains and then receive from affluents contributions of water richer in minerals. However, these contributions are not very often considerable enough to be suspected to effect a marked change of the alga flora. One instance is indeed given in Series E. Localities 49 and 62 are situated in the same water system, viz. that of the river Svartån in Närke, and the differences are obvious both in mineral contents of the water and in flora. Two further cases will be discussed.

The rivulet Lustbäcken in southern Dalarna originates in the mountains bounding the plain of Tuna; in its lower course, however, it crosses the plain itself, receiving several small affluents. The river Jumkilsån in Uppland has its sources in the largest and most pronouncedly oligotrophic district of the province. Before its outlet in the river Fyris near Uppsala it passes districts rich in marine clays, thereby increasing its water-volume considerably.

The streams mentioned have been investigated at several points regarding their alga flora, and also at some points regarding the conductivity of the water, which will give an idea of the amount of dissolved salts. For information about the places and other data see Appendix 1 B, p. 99. The results are collocated in the diagram Fig. 1. It

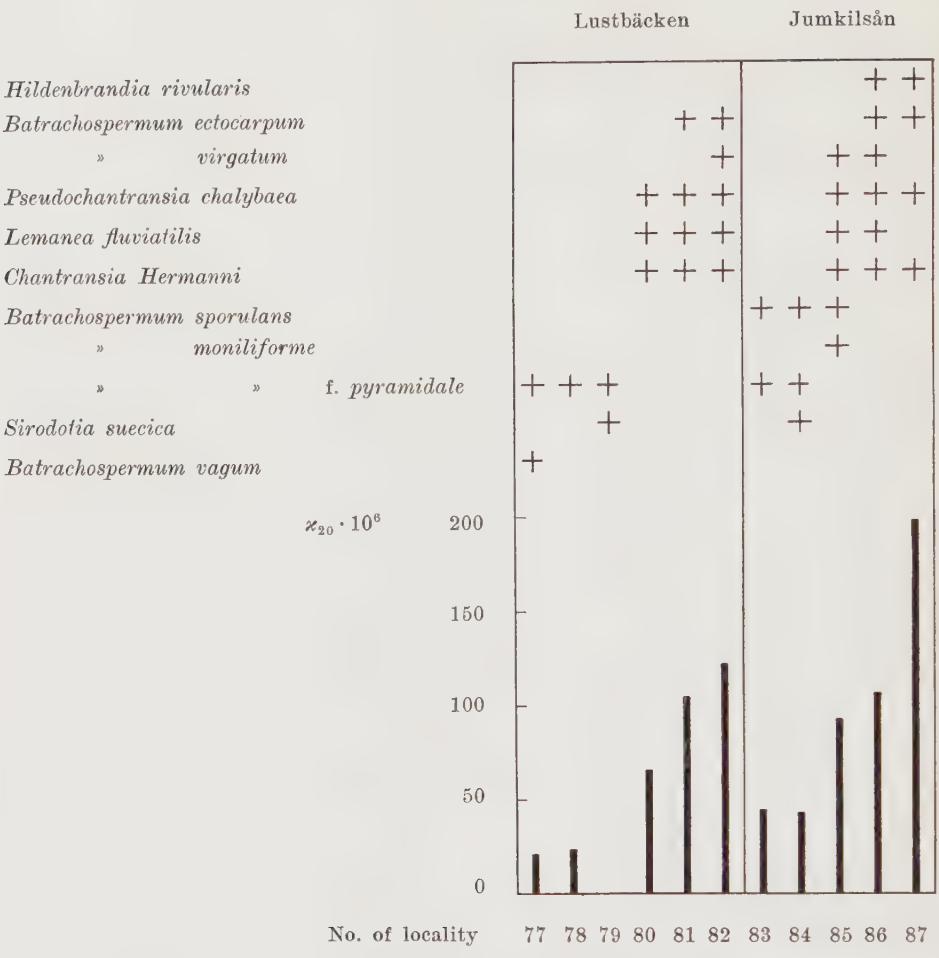

Fig. 1. Floridean flora and conductivity at different points of two streams in Middle Sweden. For further data see Appendix 1 B, p. 99.

should be especially noticed that the *Sirodotia*, *Batrachospermum vagum* and *B. moniliforme* f. *pyramidale* typical for the upper portions of the courses are, as the conductivity rises, in the lower portions replaced by *Batrachospermum ectocarpum*, *B. virgatum* and *Hildenbrandia*. This agrees perfectly with the results given by Series L and E.

Summing up, we find that the Floridea-flora of the water-courses under consideration is chiefly composed of three elements:

1. Species restricted to waters rich in electrolytes (*Hildenbrandia rivularis*, *Batrachospermum ectocarpum*, *B. virgatum* and *B. atrum*).

2. Species occurring in different kinds of water irrespective of the

amount of electrolytes (*Lemanea fluviatilis*, *Chantransia Hermanni*, *Batrachospermum moniliforme*, *Pseudochantransia chalybaea* and *Ps. pygmaea*).

3. Species restricted to waters poor in electrolytes (*Batrachospermum vagum*, *B. moniliforme* f. *pyramidale*, *B. sporulans* and *Sirodotia suecica*).

In fact, except for *B. atrum* and *B. sporulans*, which differ in various respects, species of elements 1 and 3 respectively have hitherto never been found living together in one and the same locality, not even if they occur within the same water-system.

This suggests the presence of a fairly distinct limit between two main groups of natural water, distinguished both by the flora and the content of minerals. The position of this limit from the chemical point of view cannot be adequately expressed, but according to Series L, including Middle- and North-Swedish waters, it would run at an average conductivity ($\varkappa_{20} \cdot 10^6$) of about 60, according to Series E, also including South-Swedish streams, somewhat higher.

If this may be expected to be valid for our streams in general — as the material must be said to be very representative — it is, however, evident that — if only the chemical factor is considered — the qualitative production is not a function merely of the total content of minerals. In Series L b we have a group of waters falling out of the usual scheme (character species *Batrachospermum Boryanum*), this apparently being connected in some way with their excess of lime.

Periodicity.

Periods unfavourable for growth are in most genera survived by chantransioid stages, and it is possible that all our species are perennial in this sense. On the other hand very few species look much the same all the year round, such as *Hildenbrandia rivularis* and, in most cases, *Batrachospermum vagum* also. In *B. moniliforme* f. *pyramidale* and f. *densum* hibernation is set up by the basal portions of the sexual plants, and the same phenomenon is more occasionally met with in several other species of the family, but as a rule the sexual stages are short-lived. No special studies have been made in this sphere in Sweden, and the rules formuled in the following lines and based on observations mainly in the lowland parts of Middle Sweden may prove to have many exceptions, as it is evident that more local conditions play an extraordinary part in the periodicity of several species. There are also a few observations indicating that the conditions may vary a good deal from one year to another.

In *Lemanea* the sexual shoots bud in late autumn, and the maximal development and maturity of the spores is reached in late spring or early summer the following year. Then the breaking down of the bristles begins and in late summer there may remain only scanty basal portions. Is seems that the development is slower in the mountains, as in late seasons the plants are on an average far better developed there than in the lowlands.

The Batrachospermaceae of the flowing waters usually come out in late spring or early summer when the high-water period is passed, and frequently decrease markedly in the warmest season, but a new growth-maximum occurs in the autumn and this maximum may be not less pronounced than that of the early summer, particularly so in the more eutrophic districts. A definite decrease towards the winter is undoubtedly the rule. Different species may behave in a different manner. The autumnal maximum disappears more or less entirely in species such as *B. sporulans* — a typical species of the early summer —, *B. atrum*, *B. Crouanianum* and *Sirodotia suecica*. It is, however, significant for the immense local differences that even in the middle of February 1941 *Sirodotia* occurred abundantly in the river Tunaån (Dalarna) in a narrow channel in the thick ice covering. In springs and the outlets of springs where the environmental conditions are more constant in several respects, the seasonal variation is less pronounced.

The period of fructification is very extensive in Batrachospermaceae and plants completely devoid of sexual organs are rarely found. Winter forms, however, frequently have the antheridia very sparsely developed, and well-developed gonimoblasts are often rare.

Chantransia has in England two maxima annually: one in spring and one in winter (Drew 1935). These two maxima are often obvious in Sweden too, and occur in early summer and late autumn.

Geographical distribution.

The outlines of the Swedish distribution of the freshwater Florideae may now be regarded as rather well known in several respects, but concerning the details there still remains much to be done, as our present knowledge is most uneven. From a couple of provinces, viz. Åsele Lappmark and Lycksele Lappmark, there are at present no records at all, which does not mean that the group is lacking there but only that nobody has yet looked for it. On the whole, extensive parts of Central Norrland are practically unknown, whereas northernmost Norrland as well as the southern half of the country have been subject to more

methodical investigations, and this is especially true of »Middle Sweden». Of the more than 2,300 records constituting the basis of this account about $^2/_3$ derive from the last-named district.

The geographical situation and extension of »Middle Sweden» in the present sense will appear from a comparison between maps Figs. 3 and 4 for instance. This district forms a transverse section about 540 km in length and 300 km in width through the country from the mountain chain in the northwest to the Baltic in the east. The mountains attain a maximal height of about 1700 m above sea level.

The rocks are mainly Archaean. The northwestern corner is formed by the Caledonian mountain chain. Limestone-rich Cambro-Silurian formations occur in Närke at Lake Hjälmaren and in Dalarna at Lake Siljan. The extreme marine limit runs at an elevation of about 200—250 m and divides Middle Sweden into two approximately equally large halves. Above this limit the soils are mainly non-calciferous moraines, and bogs cover considerable areas. Beneath it conditions are more varying. More or less calciferous clays are widely distributed in the southeastern provinces and the moraines are sometimes rich in lime.

The altitudinal distribution of freshwater Florideae in Sweden is seen from Fig. 3, showing the ranges found for different species.

It appears clearly from the diagram that the greatest number of species by far is met with at the lowest altitudes up to about 200 m (17 species). Considering the ecological differentiation shown in the chapter on the chemical conditions of environment, we may conclude that the reason is that these are more varying there. At middle high levels, in Middle and Northern Sweden above the marine limit, the water-types are more uniform, which is in agreement with the fact that fewer species occur.

From about 200 m and upward the number of species decreases gradually from 13 to 6 until a limit roughly coinciding with the limit of trees is reached. There a rapid fall takes place and only 2 species remain which attain 1200 m (on the mountain Helagsfjället in Härjedalen), and this is the highest elevation known at present for freshwater Florideae in Sweden.

The alpine regions are thus avoided by these algae, and this becomes still more evident, if the quantitative representation is also considered. An investigation of a larger number of localities in rapid-flowing streams of all magnitudes will at lower altitudes result in reports of Florideae in perhaps 90—95 % of all cases, while the corresponding proportions will in the subalpine and alpine regions be but 30—50 % or still less. The abundance of individuals also changes markedly in the same direction,

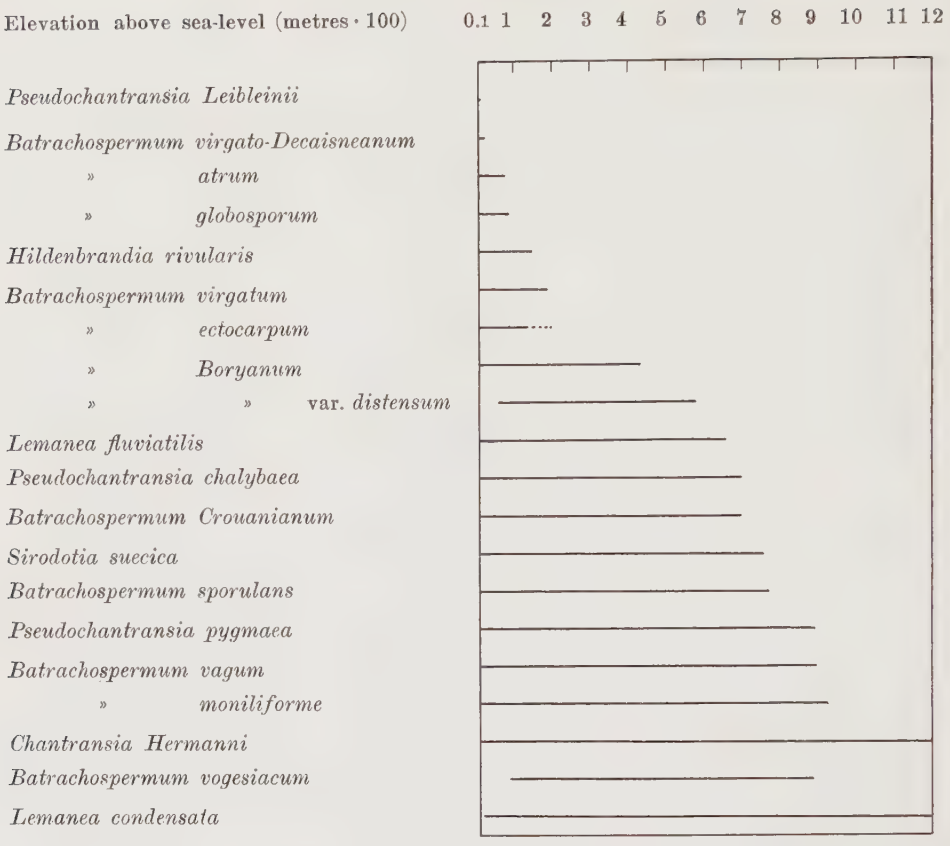

Fig. 2. Altitudinal ranges of freshwater Florideae in Sweden.

and on the whole the Florideae must be said to play a fairly unimportant part in the vegetation of the streams deriving from the high mountains except for *Lemanea* and *Chantransia*, which are sometimes richly developed.

The freshwater Florideae occur all over Sweden and except for the high mountain districts the quantitative representation must be said to be rich and much the same all the way from southern Skåne up to northernmost Lappland. As to the regional distribution of the different species there are, however, considerable differences.

The following species occur nearly all over the country: *Batrachospermum moniliforme*, *B. vagum*, *B. sporulans*, *Chantransia Hermanni*, *Lemanea fluviatilis*, *Pseudochantransia chalybaea*, *Sirodotia suecica*.

Definitely southern so far as is known are: *Batrachospermum atrum*, *B. ectocarpum*, *B. virgatum* and *Hildenbrandia rivularis*. Two very rare

species certainly are so too: *Batrachospermum virgato-Decaisneanum* and *Pseudochantransia Leibleinii*.

According to the present records the following species also should be added, but it is more likely that the present distribution areas are not complete. In any case they are known to be more northern than are the ones enumerated above: *Batrachospermum Boryanum* and var. *distensum*, *B. Crouanianum* and *Pseudochantransia pygmaea*.

The mountainous and consequently more northern *Lemanea condensata* represents another type.

The rare *Batrachospermum vogesiacum* has a northwestern distribution in southern Sweden (Fig. 19), which together with its mountainous tendency suggests a western and northern distribution in Scandinavia.

It is evident from the foregoing that the southern provinces are much richer in species than are the northern ones. From Skåne or Västergötland twice as many species are known as from Lule Lappmark or Norrbotten. The poorest flora is met with in the limestone islands of Gotland and Öland, this probably being connected with the water-chemistry, but, especially for the latter, unsuitable hydrographic conditions too.

In the following the occurrence of the particular taxonomical units will be considered in more detail. The division into groups is founded on the distribution in Middle Sweden, and the groups are named from typical representatives. In a last group the species hitherto not found within Middle Sweden are treated together with a couple of species which occur there but are very rare and show no definite distribution.

1. The Virgatum group.

To this group I assign some species which show a very well-defined distribution, being restricted to the southeastern parts of Middle Sweden. From ecological points of view they are all characterized by a marked predilection for waters rich in electrolytes, as was demonstrated in the chapter on the chemistry. Their total Swedish distribution is definitely southern. The distribution-centre is located to the southeastern provinces surrounding Lake Mälaren. In view of their penetration in the northwestern and northern directions they may suitably be divided into two subgroups:

a. Not reaching the river Dalälven: *Hildenbrandia rivularis* (Fig. 3).

b. Passing the river Dalälven: *Batrachospermum atrum* (Fig. 4.), *B. ectocarpum* (Fig. 5) and *B. virgatum* (Fig. 6).

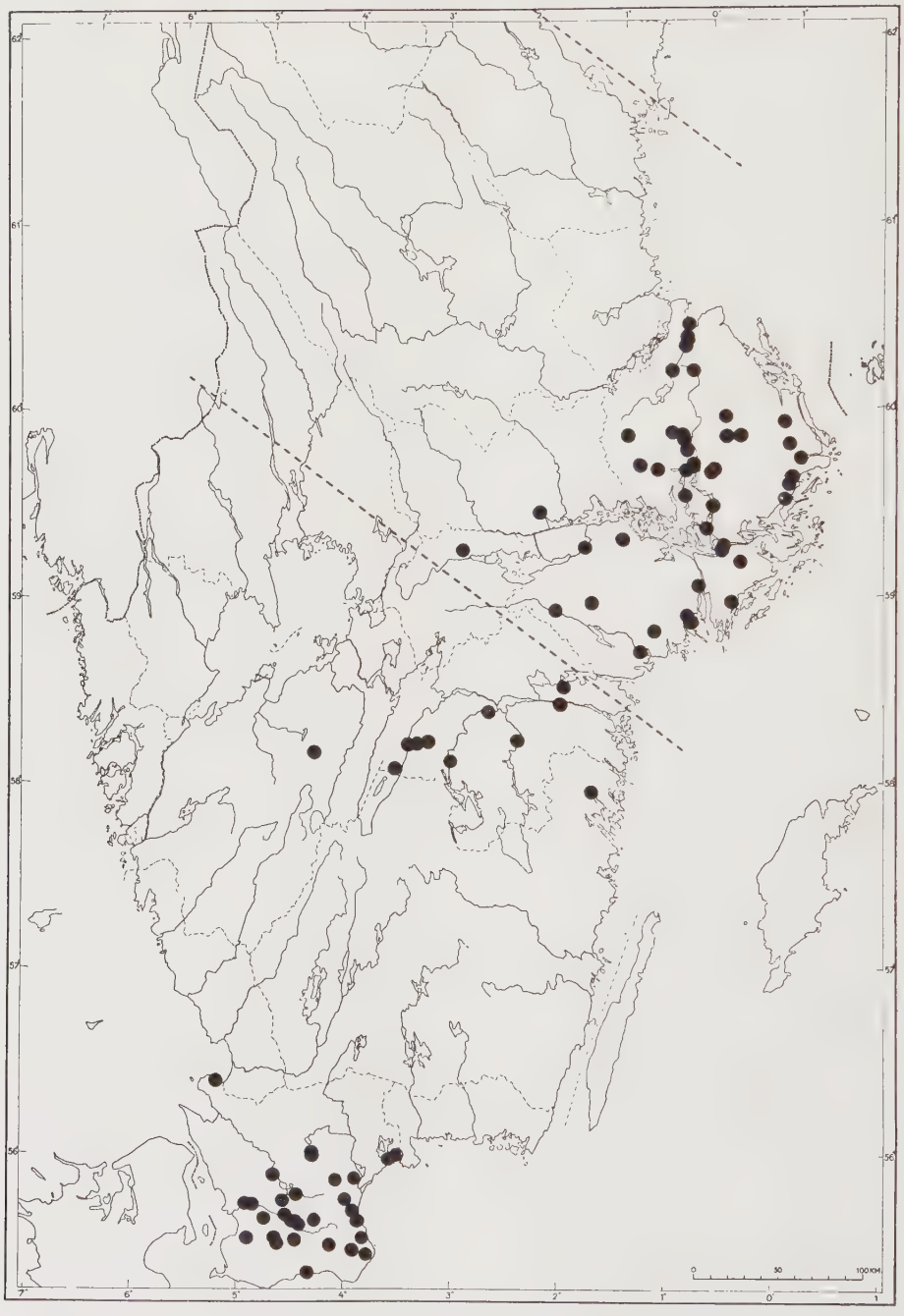

Fig. 3. The Swedish distribution of *Hildenbrandia rivularis*. (The dotted lines mark the boundaries of Middle Sweden.)

Hildenbrandia was a few years ago announced from only one Swedish locality, viz. in Skåne (Simmons 1898). At present there are more than 90 different records, and the outlines of its distribution will be rather clear. The localities known are broadly speaking distributed over two centres separated by the South-Swedish highlands, both representing the most eutrophic districts known in the country. The southern and smaller comprises the larger parts of Skåne, and the northern is located to the Baltic coast-districts from Uppland down to and including the county of Kalmar. From the coast *Hildenbrandia* mainly follows the large cultivated plains in the drainage areas of the rivers Norrström and Motala ström. It has also been found in one locality in Västergötland (in the river Slafsan), and probably it has a wider distribution within this part of the water-system of the Göta älv. In its Swedish occurrence *Hildenbrandia* evidently links up with the distribution established on the southern coast of the Baltic, e. g. in Schleswig-Holstein, (Roll 1938), Poland (Starmach 1928) and Latvia (Skuja 1926). According to the last-cited author, *Hildenbrandia* has been found in Latvia only at low altitudes (up to 200 m).

Hitherto *Hildenbrandia* has mostly been met with in running water, in rivers and brooks. The records from stagnant water are rather few. However, investigations by Waern in Mälaren have shown it to be quite common in extensive parts of this lake. Finds have also been made in several other lakes, and everything argues in favour of its being at least as common in stagnant as in running waters. *Hildenbrandia* lives on different kinds of inorganic substrata such as on rocks and stones, pieces of brick, glass, pottery, and so on, sometimes also on shells of dead molluscs, but as far as I have seen never on wood or epiphytically on water-plants.

It is usually stated that rocks and waters poor in lime are preferred (cf. Pascher 1925). Several authors, however, have observed a far-reaching indifference in this respect (Skuja 1926, Starmach 1928). Kolkwitz classes *Hildenbrandia* among the catharobic forms, but admits that it may also occur as oligosaprobic. The Swedish waters where *Hildenbrandia* has been collected, are for the most part comparatively rich in lime and not very »clean».

Hildenbrandia often plays a considerable part in incrusting communities, otherwise largely composed of crustaceous lichens. From Central Europe and Great Britain *Hildenbrandia-Heribaudiella fluviatilis* communities have been reported to be typical. Similar ones also occur in Sweden, especially in the provinces surrounding Lake Mälaren, and both in lakes (cf. also Waern 1938) and rivers. The areas of the two species,

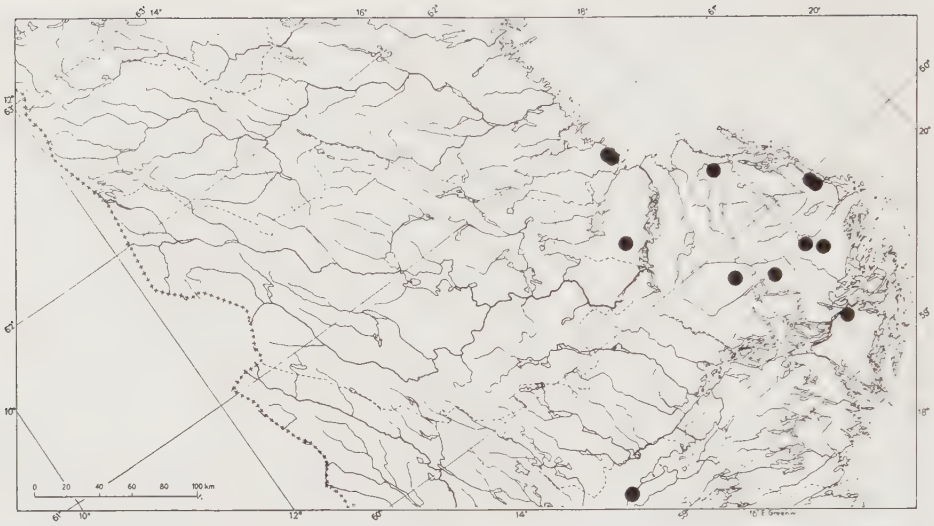

Fig. 4. The Middle-Swedish distribution of *Batrachospermum atrum*.

however, coincide only partly. *Heribaudiella* is distributed all over the country from Skåne to northernmost Lapland, but is a rarity in the former province, where *Hildenbrandia* is particularly common.

Returning to subgroup b of the Virgatum group, where the three *Batrachospermum*-species *B. atrum*, *B. ectocarpum* and *B. virgatum* belong, and comparing the maps, we find that arranged in this manner these species form a series where the elements extend further and further from the distributional centre in Middle Sweden. This might easily be linked up with decreasing demands upon the contents of minerals, but a critical examination of the localities will show such a conclusion to be misleading, at least as to *B. atrum*. Now and then and in different parts of the country this species has been found together with species of the Sirodotia group restricted to waters poor in electrolytes (cf. pag. 85), thus seeming to be less pretentious than any other member of the Virgatum group.

Kylin supposed that *B. atrum* would prove to belong to the more wide-spread species of the genus. However, curiously enough, its known area can hardly be said to have extended in any very high degree since the publication of Kylin's monograph. This is particularly clear from a comparison with other species. The number of localities, now about 30, has also not increased to anything like the same extent as in other species. Half of the localities are in Skåne and Uppland, whereas in 9 other provinces only occasional finds have been made. The northern half of Skåne is the only district where *B. atrum* has proved to be more

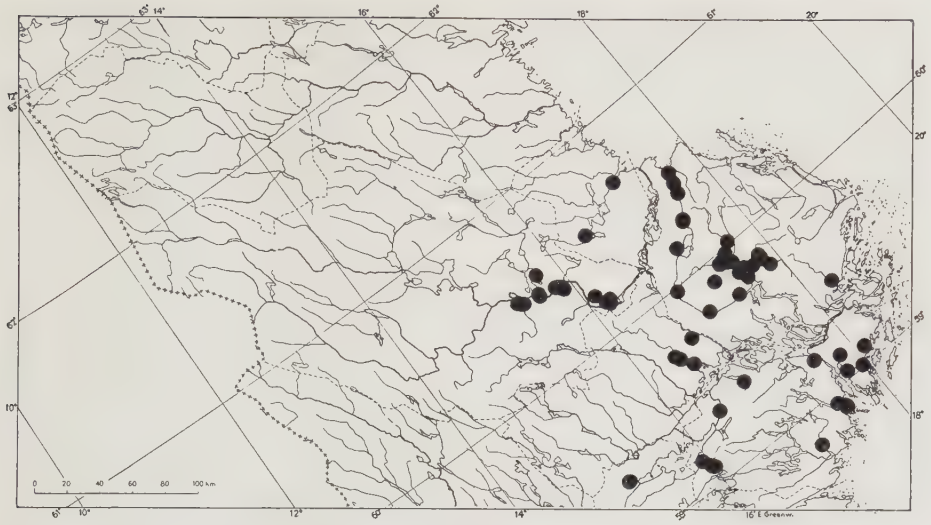

Fig. 5. The Middle-Swedish distribution of *Batrachospermum ectocarpum*.

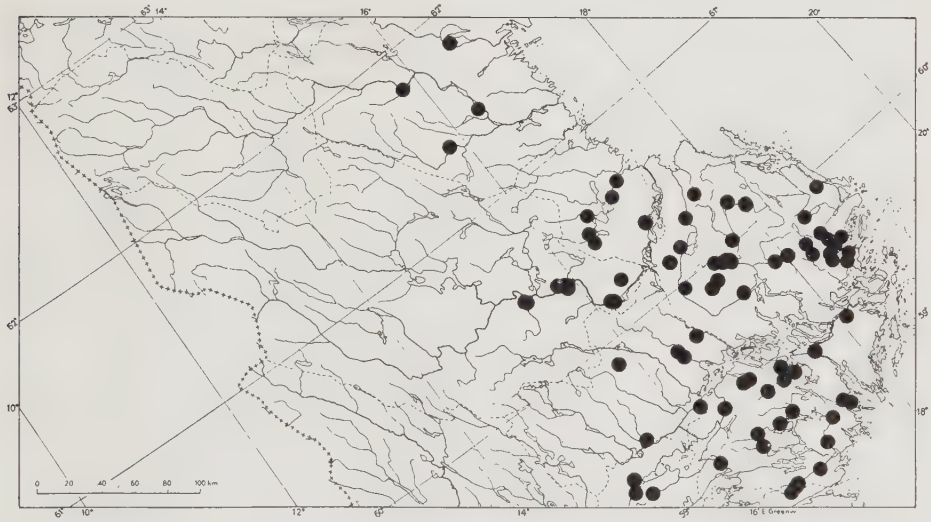

Fig. 6. The Middle-Swedish distribution of *Batrachospermum virgatum*.

frequent. The rather wide range as to water-chemistry contrasts markedly with the limited area of distribution.

B. atrum is met with in rivers and brooks, often in quantities, but also in lakes, for instance in Vättern, where it occurs as an epiphyte on stalks of *Equisetum* and *Scirpus* (Stålberg 1939).

The two remaining species of subgroup b often occur together, and form communities most characteristic of the more eutrophic lowland-

waters. Nevertheless there are some striking dissimilarities concerning the details of distribution. In eastern Uppland and central Södermanland, where *B. virgatum* is perhaps the commonest species of the genus, *B. ectocarpum* has not yet been found. This conveys the impression that the latter species is the somewhat more pretentious one.

This interpretation is supported by the isolated localities of *B. virgatum* in Hälsingland, where *B. ectocarpum* has not yet been found; but the fact that *B. virgatum* is known to be less common in Södertörn argues against it. Moreover the former species seems to be a little more frequent in southern Dalarna, where the waters show a comparatively low content of minerals. As to the Swedish distribution in general, both species show great similarities, though *B. virgatum* is considerably more widespread. This species is known from more than 100 localities in 16 provinces, *B. ectocarpum* from about 75 localities in 9 provinces.

Both species live in rivers and brooks, *B. virgatum*, also in stagnant waters (Cedergren 1938 b). As was observed by Sirodot already and confirmed by Kylin, *B. virgatum* usually occurs only in single scattered plants, not often in quantities. This is perhaps one of the reasons why this easily recognized and wide-spread plant has so seldom been noticed.

Among the maps showing the distribution in northern Europe of higher water plants and published by Samuelsson and others, there are several showing »eutrophic» types. It may be of some interest to compare these maps with those of the species of the Virgatum group. In several cases a far-reaching conformity is obtained. For *Hildenbrandia* this is the case with *Ranunculus circinnatus* (Samuelsson p. 109), and for species of subgroup b similarities are shown e. g. by *Potamogeton zosterifolius* (Samuelsson p. 134), *Butomus umbellatus* (l. c. p. 139), *Stratiotes aloides* (l. c. p. 142) and *Lemna trisulca* (Lohammar 1940 p. 206). The correspondence will largely be extended to South Sweden too, with the interesting exceptions that all the phanerogams cited also occur in southern Skåne — where of the algae only *Hildenbrandia* has been found —, *Butomus* and *Lemna* also in Öland and Gotland, where the Virgatum group is unrepresented.

In northern Sweden Lohammar recognized several higher water-plants which in the southern parts of the country are restricted to eutrophic waters, among them the *Potamogeton-*, *Butomus-*, and *Lemna*-species just mentioned. However, these more pretentious species occurred there in waters with a lower content of electrolytes than in the south. Furthermore the »trophic limits» were less sharp in the north: »eutrophic» and »oligotrophic» forms occurred mixed together. It might then be expected that algae of the Virgatum group would be well represented in the

brooks and rivers of Norrbotten, and it is remarkable that they have not been found at all. In respect of mineral contents, however, the North-Swedish waters under consideration are more or less below the waters where the Virgatum group is known to occur, The absence of this group in the north can therefore be explained if we suppose that its demands upon the water-chemical conditions are not realized there.

2. The Boryanum group.

Batrachospermum Boryanum (Fig. 7) shows a most interesting and very isolated position among the freshwater Florideae. I know it from three different districts in Middle Sweden, viz. western Närke, the neighbourhood of Lake Siljan in Dalarna, and southernmost Jämtland. In all these cases the connections with the occurrence of Cambro-Silurian limestones seem to be clear, and this will be applicable to the other Swedish occurrences too. Its main district of distribution in South Sweden is southern Skåne (14 of the 37 Swedish localities known), where it is fairly common, in frequency clearly exceeding all other species of the genus except *B. moniliforme*. In the southernmost parts of this province it quite dominates the *Batrachospermum*-flora. There are also several localities in the Storsjö-district in Jämtland, and *B. Boryanum* is probably rather common there. Finally I have collected it in Västergötland too.

Sirodot states that in Brittany *B. Boryanum* lives in »ruisseaux traversant des régions légèrement tourbeuses», and Skuja (1928) communicates a locality in Latvia where the water was »typisch dystroph, von dunkelbrauner Farbe». If the species occurs under such conditions in Sweden it must be only exceptionally (cf. however var. *distensum*). Most facts speak for high demands on lime, though it must be admitted that the occurrence in Helgeån hardly supports this view (cf. Supplement, Series E, No. 68). It is remarkable from this point of view that *B. Boryanum* seems to be entirely lacking in wide districts, where the water is rich in lime though rather different in other respects, such as Gotland[1] and Uppland. A comparison with the distribution of *Potamogeton filiformis* (Samuelsson p. 59), known as a reliable indicator of lime, may be of interest in this connection. Regarding the freshwater occurrence, there are apparent similarities between this species and

[1] Kylin communicates one find in Gotland (Hörsne). All specimens seen belong however, to *B. moniliforme*. For Witte. et Nordst., Alg. exsicc., No. 1006 (Borås) I must refer the single specimen seen to *B. Crouanianum*.

Fig. 7. The South-Swedish distribution of *Batrachospermum Boryanum* (●) and var. *distensum* (○).

B. Boryanum, except that there are numerous localities for *Potamogeton* also in Uppland, Södermanland and Gotland.

Batrachospermum Boryanum has only been met with in rivers and brooks, but often in abundance.

3. The Chantransia group.

This group is characterized by a wide distribution within Middle Sweden, both in the northwestern and in the southwestern halves. The species occur both in typically eutrophic and in typically oligotrophic waters — though not always in the same frequency. As to the total amount of dissolved solids in the water they seem to be rather indifferent. In agreement with their more »eurytrophic» character, their total Swedish distribution comprehends almost all the country.

With regard to the details the five species might be distributed into four subgroups:

a. *Pseudochantransia chalybaea* (Fig. 8).
b. *Pseudochantransia pygmaea.*
c. *Lemanea fluviatilis* (Fig. 9), and *Chantransia Hermanni* (Fig. 10).
d. *Batrachospermum moniliforme* (Fig. 11).

Pseudochantransia chalybaea shows a pronounced maximum in the southeastern districts, where it is the commonest Floridea and one of the most characteristic stream-algae on the whole. Outside the more eutrophic zones it is by no means common, though widely distributed, and might therefore be regarded as a transitory type between the Virgatum group and the Chantransia group (cf. its supposed character, at least partly, of a stage of *Batrachospermum virgatum*).

Though occassionally found also in lakes, *Ps. chalybaea* is mainly an inhabitant of running waters.

On the whole *Ps. chalybaea* must be said to be common in Sweden, as it is known from about 230 localities in 25 provinces. The distribution is, however, very uneven, and the differences discernible in Middle Sweden seem to be characteristic all through, i. e. it is more frequently met with in the eutrophic series. In Norrland it is rare. At least for the Middle-Swedish distribution, *Ps. chalybaea* is very reminiscent of *Potamogeton praelongus* (cf. Samuelsson p. 58).

According to Kolkwitz, *Ps. chalybaea* is β-mesosaprobic. The range is, however, far wider, and with regard to some localities in northernmost Dalarna and in Härjedalen it can certainly also be designed as catharobic.

Pseudochantransia pygmaea is known from about 60 localities in 13

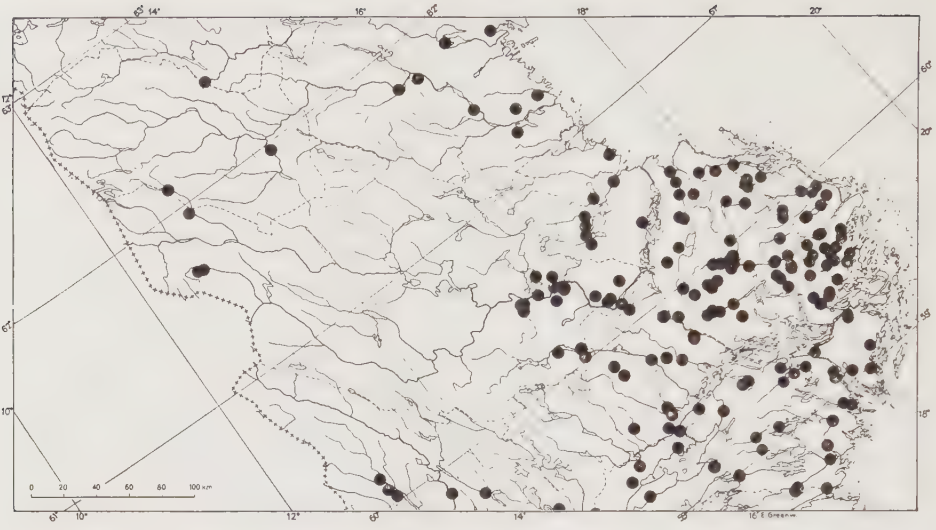

Fig. 8. The Middle-Swedish distribution of *Pseudochantransia chalybaea*.

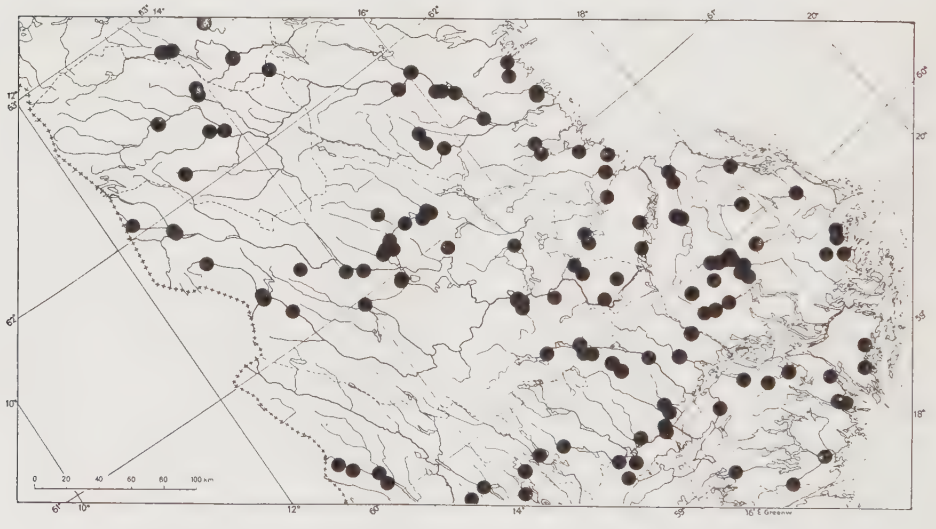

Fig. 9. The Middle-Swedish distribution of *Lemanea fluviatilis*.

provinces from Skåne to Jämtland. It does not belong to the very common forms except in some Cambro-Silurian limestone districts, where it may sometimes be of considerable importance in the vegetation of rapids. The distribution is thus concentrated to the districts of *Batrachospermum Boryanum*, which supports the hypothesis of *Ps. pygmaea* being partly chantransioid stages of this *Batrachospermum*-species. In

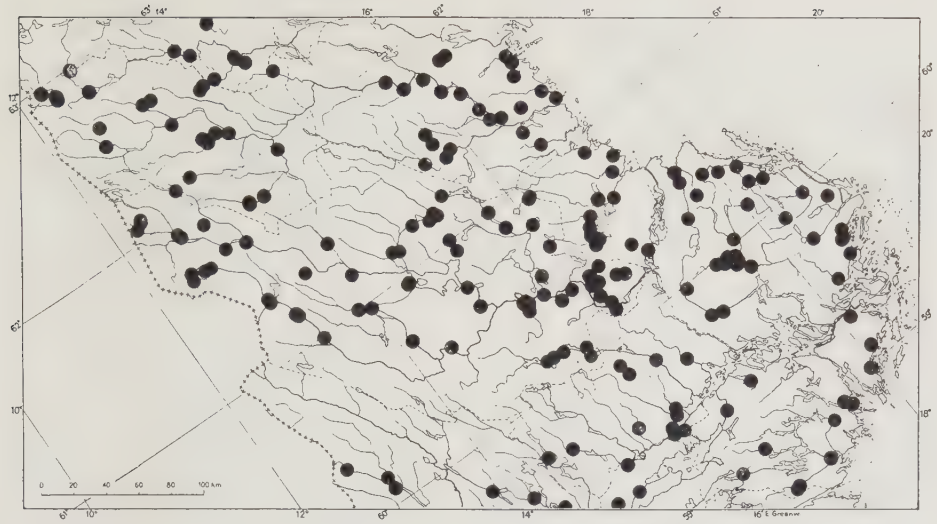

Fig. 10. The Middle-Swedish distribution of *Chantransia Hermanni*.

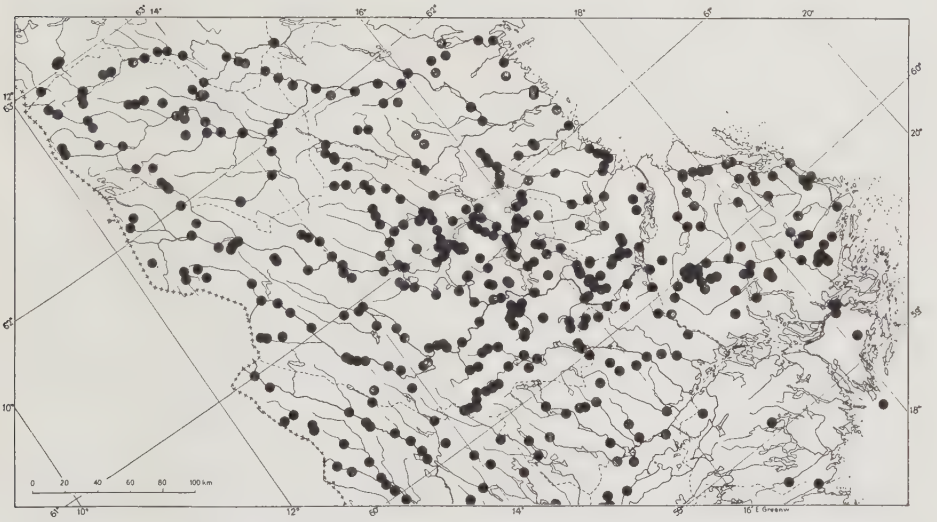

Fig. 11. The Middle-Swedish distribution of *Batrachospermum moniliforme*.

Middle Sweden there are numerous localities north of Lake Siljan and for the rest scattered ones in all provinces. Waters rich in humus are avoided.

The members of subgroup c, *Lemanea fluviatilis* and *Chantransia Hermanni*, are common inhabitants of rapids and water-falls, and both are at present known from about 300 localities in 25 provinces. They

frequently occur together, *Chantransia* often as an epiphyte on *Lemanea*.

The maps show rather uniform distributions in Middle Sweden, yet with several interesting gaps, which appear from a comparison with maps Figs 12—14, and the most conspicuous of which comprises wide areas on both sides of the boundary between Dalarna and Värmland — Västmanland. It can hardly be doubted that this and other gaps are largely connected with a certain tendency in *Lemanea* and *Chantransia* to avoid the extreme humus-waters

According to Oltmanns and Pascher, *Lemanea* occurs in cold, clear mountain brooks. As a matter of fact *L. fluviatilis* is as common in the rapids of the fertile lowland plains as in the mountains.

Pascher remarks that *Lemanea* often lives in calcareous water. In Sweden, however, its frequency is by no means smaller in waters poor in lime. The absence of the genus in Gotland should also be noticed.

According to Kolkwitz, *Chantransia* »spp.» are catharobic. In any case the range of *Ch. Hermanni* is far wider. It is significant that this species often occurs together with *Ps. chalybaea*. The two species, habitually identical except for the colour, form characteristic communities on rocks and stones and frequently on *Fontinalis*, where the bright red of *Chantransia* makes an effective contrast with the bluish green of *Pseudochantransia*. These communities are especially typical of the lowland rivers.

Batrachospermum moniliforme is the Floridea by far most frequently found in our freshwaters (about 700 localities in 27 provinces), and will be one of the commonest stream-algae on the whole. Its superiority in this respect is, however, expressed mainly in the oligotrophic types of waters. Considering the numerous localities in Uppland shown by the map, this statement may appear somewhat astonishing. Moreover, too much importance must not be attached to the paucity of localities in Södermanland, as this is certainly largely due to the fact that the survey has not been so thorough there. It is also true that waters rich in nutritive matter are by no means avoided. In the eutrophic waters, however, several other species are equally frequent, in places even more frequent, and *B. moniliforme* is also more sporadic there, as the persistent forms *pyramidale* and *densum* do not occur. The distribution in Middle Sweden is very uniform, and from the chemical point of view this species is the most pronounced ubiquite among our freshwater Florideae.

B. moniliforme is known chiefly from running water, and has also been found in springs. The records from lakes are few, but there are

some facts suggesting that the species is far less common there than might be expected. On the other hand, the abundance seems usually to be low, the species being often represented by but small and sparse plants in limited areas, so that it may easily be overlooked. Besides on stones and rocks on the shores, *B. moniliforme* lives as an epiphyte on the stalks of higher water-plants. A very small form (var. *isoëticola* Skuja) is sometimes met with on *Isoëtes*-species and mosses down to a depth of about 2 m.

4. The Sirodotia group.

The feature in common to all members of this group is that they clearly avoid the typically eutrophic waters. They are characteristic of the more northern and western districts, on low and middle-high levels, a fact agreeing with their occurrence in waters poor in minerals. The localities in the southeastern parts of Middle Sweden are scattered and must be regarded as isolated outposts from the coherent northwestern area. In all cases they seem to be directly referable to locally divergent water-types.

The distributions seem at first to be fairly uniform, but comparing the maps more thoroughly, we find some interesting differences making a division into two subgroups possible:

a. *Sirodotia suecica* (Fig. 12), *Batrachospermum vagum* (Fig. 13), and *B. moniliforme* f. *pyramidale* and f. *densum* (Fig. 14).

b. *Batrachospermum Crouanianum* (fig. 15), and *B. sporulans* (Fig. 16).

The species of subgroup a show a slight concentration of their localities to a broad zone through northern Värmland, southern and eastern Dalarna and the neighbouring parts of Hälsingland and Västmanland. This will be the zone of the most pronounced and most frequent humus-waters of the map-territory. And as a matter of fact the forms enumerated reach their best development by far in brown waters. Often mixed together in brooks and rivers, they form highly characteristic communities not infrequently dominating the vegetation of the rapids. On the whole it may safely be said that the Batrachospermaceae in these waters develop on an average a quantitative richness hardly reached elsewhere.

Sirodotia suecica is at present known from 185 localities in 21 provinces, thus occupying the second place in frequency among the Batrachospermaceae in Sweden. It occurs in brooks and rivers and on different substrata, often as an epiphyte on the old fronds of *Batracho-*

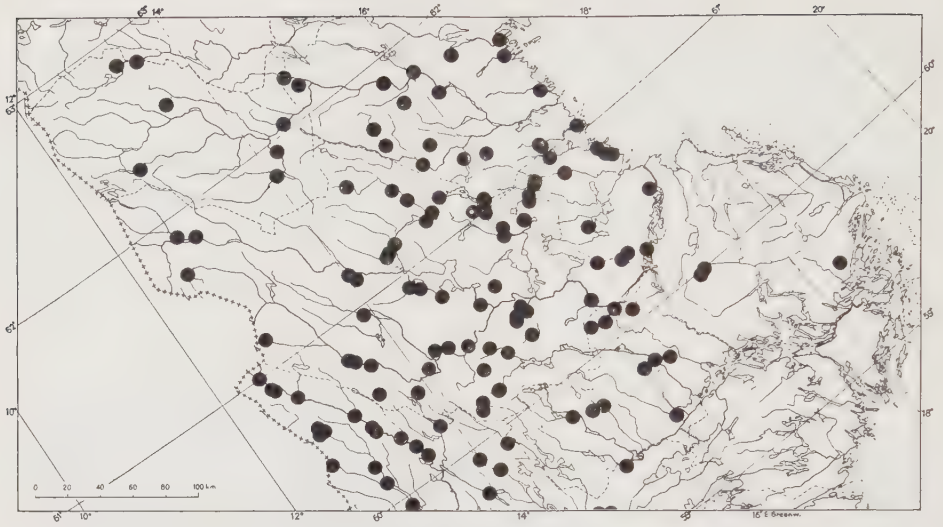

Fig. 12. The Middle-Swedish distribution of *Sirodotia suecica*.

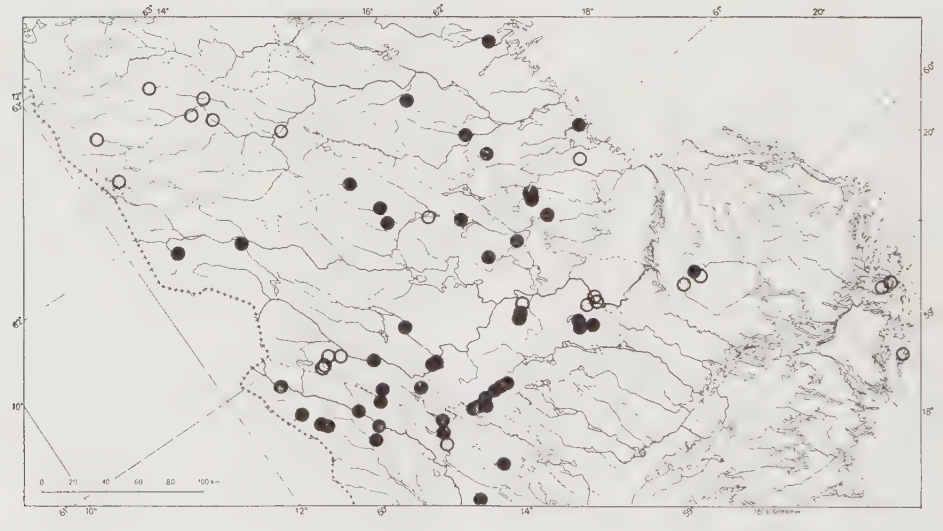

Fig. 13. The Middle-Swedish distribution of *Batrachospermum vagum* (● = in running water, ○ = in stagnant water).

spermum. Its preference for humous waters is evident, though it may occur also in »oligohumous» water, but hardly in abundance.

In the investigations of Skuja the genus *Sirodotia* has proved to possess a world-wide distribution, being represented in different continents by rather closely related forms. In Europe it seems not to have been noticed so far except in Sweden and Finland.

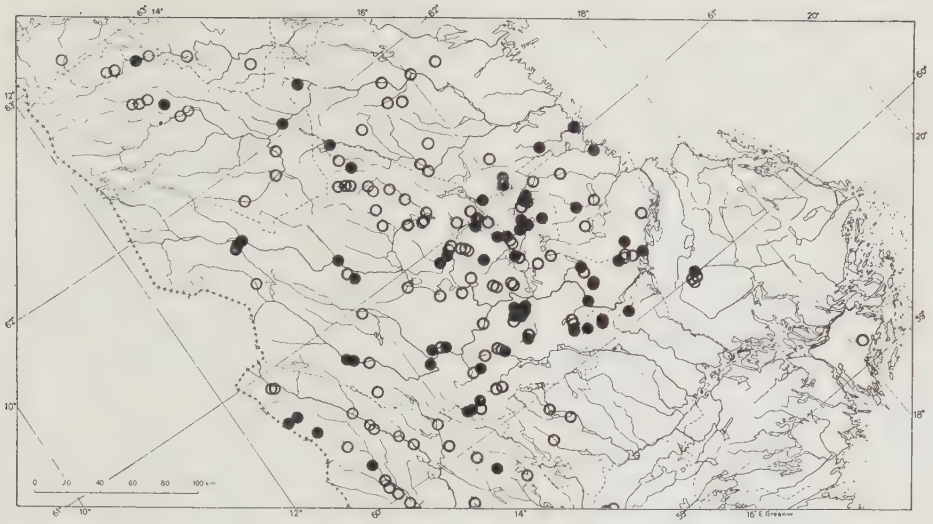

Fig. 14. The Middle-Swedish distribution of *Batrachospermum moniliforme* f. *pyramidale* (●) and f. *densum* (○).

For the number of localities known (126 in 23 provinces) *Batrachospermum vagum* stands only third among the Batrachospermaceae in Sweden; yet it is probably the species best known to botanists in general. This may be partly due to its characteristic habitus which make it easy to recognize, but its preference for stagnant habitats will be of still greater importance. Investigators working on water-vegetation formerly collected their material mainly in lakes and pools, and therefore a comparatively extensive material was early brought together. Kylin, devoting his attention to running water, emphasized the peculiar fact that he had himself so seldom observed *B. vagum*, though his list of localities showed it to be the commonest species of the genus next to *B. moniliforme*.

B. vagum is characteristic of lakes, tarns, ditches and water-holes in peaty moors etc. with very brown water, and often occurs in quantities. It is remarkable that the distribution in running waters does not cover that in the stagnant habitats. In the latter habitats *B. vagum* is also common at high altitudes, as is established by records in several works dealing with the alga-flora in different parts of the mountain districts of Scandinavia. The localities in streams are all distributed within the main area of subgroup a. It is probable that, being preferably a stagnant-water species, *B. vagum* enters the running series only in waters very rich in humus.

In the map, the lake distribution of *B. vagum* must be highly under-

Fig. 15. The Middle-Swedish distribution of *Batrachospermum Crouanianum*.

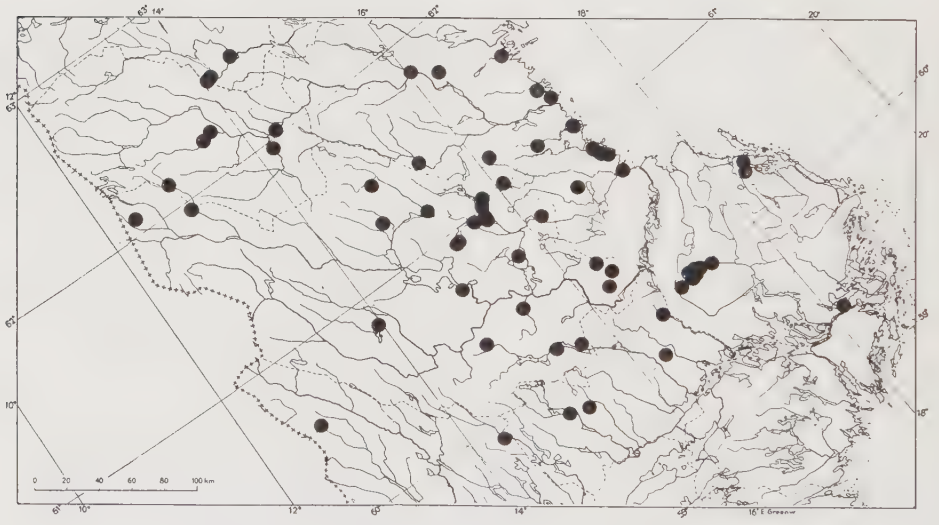

Fig. 16. The Middle-Swedish distribution of *Batrachospermum sporulans*.

represented, as the stagnant waters have been far less frequently investigated than the running ones.

B. vagum is the only species of the genus more often recorded from high mountains. In Norway it has been found at an elevation of 1230 m (Strøm 1926).

According to Kolkwitz *B. vagum* is oligosaprobic — β-mesosaprobic, but to judge from the occurrence in Sweden this range is too wide.

The two forms of *B. moniliforme*, f. *pyramidale* and f. *densum*, show about the same distribution. They are of considerable interest as they seem to be developed only in streams bearing water more or less rich in humus but poor in minerals.

The species of subgroup b show a more uniform distribution; at least no special accumulation in the previously mentioned central zone can be seen. For the rest they show characteristic differences.

B. Crouanianum seems to avoid the extreme brown waters. In Middle Sweden it is entirely restricted to waters poor in minerals, and this will be the rule in other districts too. However, it should be noticed that on a couple of occasions it has been collected in Skåne together with typical representatives of the Virgatum group such as *B. ectocarpum*.

It has been met with in rivers, brooks and springs. By its 43 localities in 14 provinces from Skåne up to Jämtland and Hälsingland it has proved to be widely distributed in the southern half of the country, but does not belong to the very common species.

B. sporulans resembles the preceding species in many respects. The marked minimum in the southeastern parts of the area surveyed is noticeable. However, the tendency of *B. sporulans* to be restricted to the early parts of the summer makes a complication in so far that it cannot be said with certainty if the map does full justice to the real distribution to the same extent as with other species. Its position is therefore somewhat uncertain. It has also been found together with species of subgroup a more frequently.

In Sweden as a whole it has at present almost 90 known localities in 16 provinces from Blekinge and Småland to Norrbotten and Lule Lappmark. It occurs in rivers and brooks and springs, but also in lakes (Simonsbosjön in Dalarna, leg. G. Lohammar), usually together with *B. moniliforme*.

Avoiding the more eutrophic waters in general, *B. sporulans* seems to be quite indifferent concerning the percentage of Ca, as appears from its occurrences in the outlet of Lake Markasjön in Uppland (a »Chara lake» according to Almquist 1929, p. 92) and in Gotland where it is very common.

On comparing the maps of the Virgatum group with those of higher water-plants it was possible in several cases to establish a striking conformity. The result of a corresponding comparison with the Sirodotia group is more negative. Some »oligotrophic» plants, such as *Potamogeton*

polygonifolius (Samuelsson p. 92) and *Sparganium glomeratum* (l. c. p. 128) show distributions similar to those of *Sirodotia* or *Batrachospermum vagum* in southern Middle Sweden, but towards the north they rapidly disappear, probably for climatic reasons.

In *Sparganium affine* (l. c. p. 67) we find, however, »eine ausgeprägt oligotrophe Pflanze ohne jede Einschränkung», which also occurs through the northern parts of Middle Sweden. The most conspicuous difference between the maps of *Sparganium affine* and *B. vagum* is constituted by the comparatively numerous localities of the former in certain parts of Uppland and Södermanland, particularly in the coastal districts. But it is possible that this difference is to a great extent due to imperfect investigation, and on the whole it hardly seems to be of fundamental nature.

5. The Condensata group.

I assign two species which have in common that they show a distinct mountainous tendency to this group. In other respects there are important differences.

Lemanea condensata (Fig. 18) differs from all other Florideae in having its main distribution in the high mountains, where it occurs in glacier brooks and other cold streams. In the big rivers of Norrland which have their sources in the high mountains it follows the rivers far downstream (cf. the occurrence in the rapids of the river Kalixälven at Kamlunge.) There are also more isolated outposts at lower levels (Värmland). As to habitat, there seem to be no essential differences between *L. condensata* and *L. fluviatilis*. Hitherto about 30 localities from the provinces of Torne Lappmark, Lule Lappmark, Norrbotten, Jämtland, Härjedalen and Värmland are known.

Batrachospermum vogesiacum (Fig. 17) is more low-mountainous. This rare species is at present known from 5 localities in as many provinces, and its entire Scandinavian distribution is seen in the map. Besides in the northwesternmost parts of Middle Sweden it has been collected on the two mountains of Kynnefjäll in Bohuslän and Hunneberg in Västergötland. It is remarkable also because it has apparent ecological similarities with the Sirodotia group, and has also been met with growing together with *Sirodotia*. Its best development is evidently reached in brown humous waters.

Among higher water-plants there are no correspondences to this group.

6. **Imperfectly known species.**

Batrachospermum virgato-Decaisneanum was discovered by Sirodot on the shells of *Limnaea* and *Planorbis* in pools, and also on floating roots. The two Swedish localities known are also stagnant habitats. In 1832 it was collected by J. Agardh in a bog in the vicinity of Lund, and in 1868 by O. Nordstedt on a decaying wooden bridge in a marsh near Alnarp together with *B. moniliforme*. During the past 70 years and more nobody has observed this rare and interesting alga in Sweden.

Pseudochantransia Leibleinii occurs in the river Segeån near Malmö, at the outlet of a small mill race, where the water makes a slight fall. The brownish-violet carpetings of the alga cover the stones at the foot of the fall in very shady positions. In a second locality in the river Kävlingeån north of Lund *Ps. Leibleinii* likewise occurs in very strong exposure of current in the outlet of a mill dam. In both localities *Hildenbrandia* was noticed.

Batrachospermum globosporum has hitherto been found in 4 localities, two of which are in Middle Sweden. This new species seems to have its own peculiar type of distribution (Fig. 17). All localities are in lakes, viz. in Vättern (cf. Stålberg 1939, p. 48, s. n. *B. vagum* ssp. *flagelliforme*), and a couple of smaller ones: Åsgarn in Dalarna and Mårdängssjön in Gästrikland. For the two latter, Dr. Lohammar has kindly communicated the following information. In Lake Åsgarn *B. globosporum* was observed in 1940 and 1941 — less frequently in the latter year — at a landing-place where it occurred on the stalks of *Phragmites* close to the outflow of some springs. In Lake Mårdängssjön it was exclusively noticed on the shells of living *Limnaea*. In mineral content the lakes mentioned will occupy an intermediate position (as for Vättern cf. Alméx 1879, p. 99, and Lohammar in Stålberg 1939, p. 16, and for Åsgarn cf. Lohammar 1939, p. 109).

Batrachospermum Boryanum var. *distensum* (Fig. 7) is known from 9 localities in rivers and brooks from Skåne to Härjedalen (6 provinces). It is probable that the distributional centre is located at the South-Swedish highlands, where it occurs in rather humus-rich waters. Regarding the trophic range it is, however, related to the species of the Chantransia group as it has been collected together with members of both the Sirodotia and the Virgatum groups. Each of the two remaining Florideae is known from only one locality in lakes. For information concerning *Pseudochantransia chalybaea* var. *profunda* found in Vättern the reader is referred to Stålberg 1939 p. 46.

Pseudochantransia serpens was collected 1937 in Lake Ö. Vântjärn in

Fig. 17. The Swedish distribution of *Batrachospermum vogesiacum* (●) and *B. globosporum* (○).

south eastern Jämtland by Fil. mag. T. Borgh. This lake is a small, shallow (maximal depth 3.5 m) forest tarn with boggy shores. August 1933 I had the opportunity of visiting the locality under the kind guidance of T. Borgh. Dragging at the eastern shore showed that down to a depth of about 2 m the vegetation consisted of mosses. Beneath the moss-carpeting at 2—2.5 m the muddy bottom (greenish brown *dy-gyttja* of low coprogenity) was covered exclusively by a loose alga felt of *Ps. serpens*.

Floridea-regions.

The Florideae have hitherto played a most unimportant part in discussions on regional divisions founded on the distribution of freshwater algae. Budde (1928) subdivides certain brooks in Germany into two regions, viz. an upper Hildenbrandia region and a lower Lemanea region, but at least as far as concerns the Florideae there are evidently no correspondences to these regions in Sweden. The same is true of the same author's Batrachospermum »ectocarpum» region, as he calls the course of the river Ruhr (Budde 1930).

In Fig. 18 the distribution of the Virgatum and the Sirodotia groups are mapped, each represented by a couple of typical representatives. It is seen that taken together they occur almost all over the map area. Further they never meet in one and the same locality, and each by themselves they form largely coherent areas of distribution. In fact they form a natural base for the distinguishing in Middle Sweden of two main regions, which we may call the Virgatum region and the Sirodotia region. The facts previously presented indicate that fundamentally these regions are water-chemical. It is very likely that the limit between the two regions is fairly distinct all the way, but further investigations are necessary to establish its course in details.

So far as is known the Virgatum region comprises practically all the water-systems of Södermanland, Närke (except for the westernmost parts), Uppland, and eastern and southern Västmanland (including those of Sagån, Svartån — except for the upper parts —, Köpingsån, and Arbogaån — the very nethermost parts). Several smaller affluents in the lower parts of Ljungan, Ljusnan, Dalälven, Gavleån, Hedströmmen, and Svartån (Västmanland) are outposts from the region.

The Sirodotia region comprises the remaining water systems of Middle Sweden below the fjelds. Outposts in the Virgatum region are: the upper portions of the water-system of Jumkilsån (affluent of Fyris), a brook at Annarby in the parish of Österåker (south eastern Uppland),

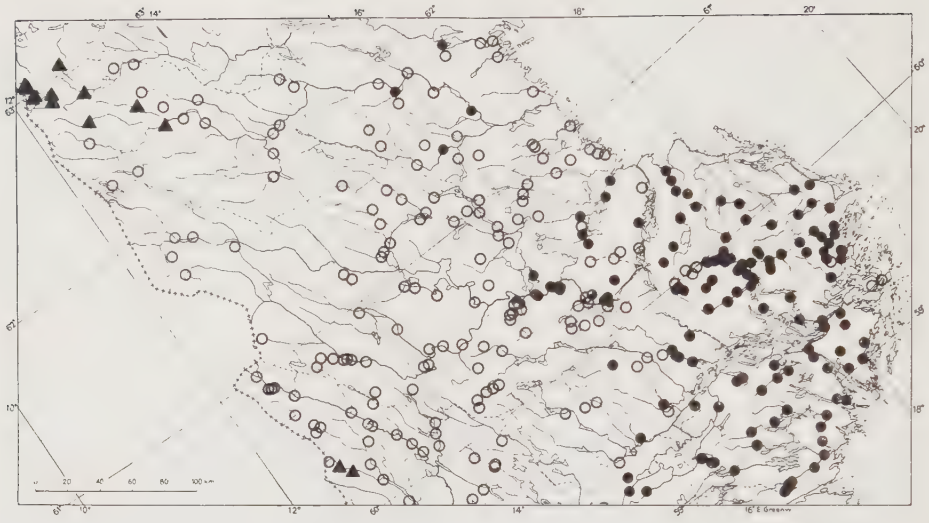

Fig. 18. The Middle-Swedish distribution of the Virgatum group *(Batrachospermum virgatum, B. ectocarpum* and *Hildenbrandia rivularis)* — ●, the Sirodotia group *(Sirodotia suecica* and *Batrachospermum vagum)* — ○, and *Lemanea condensata* — ▲.

Lake Natsjön (a source-lake of Örsundaån), some lakes in islands of the Skärgård off Stockholm and Södertörn, and probably a brook in the parish of Österhaninge (Södertörn) where typical *Batrachospermum moniliforme* f. *pyramidale* has been collected.

It is evident that the two regions can also be followed through very extensive areas in other parts of Sweden.

Fig. 18 shows also the distribution of *Lemanea condensata*. To judge from the map we might not unreasonably let it represent a third region, located in the high mountains and with an outpost in Värmland. The relations to and limits as against the Sirodotia region of this region are, however, not so clear as might be expected. Moreover, the Florideae are comparatively sparse in the mountains, and to make the region more natural it would be necessary for its characterization also to take other alga groups into account, and so it had better be left undefined at present.

Finally, it may be of interest in this connection to compare Naumann's map of the »lake-provinces» of South Sweden (Naumann 1932 p. 45) with the known distribution of the Florideae. In doing so we find an apparent conformity on the whole, but notable differences in details.

For the eutrophic series, the argillotrophic districts must be said to be generally very well characterized by the presence of the Virgatum group and the absence of the Sirodotia group. West Sweden (northern

Bohuslän and southern Dalsland) constitutes, however, an exception. It is true that species of the Virgatum group occur there, though not very frequently, but the Sirodotia group is much more abundantly represented, so that it is evident that conditions are more varying than might be expected from the map.

In respect of the flora the limits between the argillotrophic and the eutrophic districts s. str. do not seem to be very distinct. It should, however, be noticed that a wide area in southern Skåne is distinguished from the argillotrophic districts in general, both positively by the presence of *Batrachospermum Boryanum* and more frequent occurrence of *Pseudochantransia pygmaea*, and negatively by the absence of all species of subgroup b of the Virgatum group — this probably indicating an especial type of water. The known extent of this area coincides on the whole with the Scanian distribution of *B. Boryanum* (see Fig. 7) and *Hildenbrandia* (see Fig. 3).

As to the oligotrophic series, the dystrophic and siderotrophic districts are both well characterized by the presence of the Sirodotia group and the absence of the Virgatum group, but nothing has been found suggesting an essential difference between the two districts with regard to the Floridean flora.

The alkalitrophic districts are mainly characterized negatively by their remarkable paucity of species.

The oligotrophic districts s. str. are very unclear. In any case the largest one, including Vättern and the district southeast of this lake, does not show any similarities with the other oligotrophic districts s. lat. The present data, rather scanty indeed, do not contain any reports of species of the Sirodotia group; on the other hand some members of the Virgatum group have been met with, such as *Hildenbrandia* and *Batrachospermum virgatum*. In respect of the flora the district thus seems to be more closely related to the eutrophic series than to the oligotrophic one.[1] As for the numerous streams probably answering the definition of the oligotrophic water type s. str. (»harmonious oligotrophy»), and situated mainly in the more mountainous districts outside the area of Naumann's map, there are hardly any definite qualitative differences

[1] This is also supported by the presence in Vättern of *Cladophora glomerata*, which is very closely related to *Hildenbrandia* in its Swedish occurrence, but, according to Stålberg (p. 26), hardly by the plankton: »The plankton type is a Caledonian one . . ., though with some Baltic traces», for it is evident that the Caledonian plankton (Teiling 1916) largely corresponds to the Sirodotia group as well as the Baltic plankton corresponds to the Virgatum group, although it must be left undecided how far the parallelism reaches.

from the variants rich in humus or iron. The non-brown waters are sometimes slightly richer in species than the brown ones, but the quantitative production is as a rule far behind that of the latter. By the way, the species of subgroup a of the Sirodotia group in particular seem to be considerably stimulated in the waters rich in humus, and this fact contrasts effectively with the low production of plants usually said to characterize the dystrophic waters poor in minerals.

Appendix 1.

Localities of water-chemical and Floridea-floral investigations.

A. Localities of the Supplement.

In the first column the localities and years of the alga collections are given in detail. The numbers refer to the diagrams of the Supplement. The names of rivers and brooks are in parenthesis.

In the second column the corresponding lakes or rivers are to be found from which the chemical analysis material was gathered with the designations used by the respective authors: Lohammar 1938 (Series L) and Eriksson 1929 (Series E).

Series L a.

1. Norrbotten: Hietaniemi, Littiäinen (Littiäsoja), 1940	104 Littiäsjärvi
2. » Karl Gustav, Linka (Jokihaara), 1940	107 Rutajärvi
3. » » » Oja, 1940	125 Sorttijärvi
4 Uppland: Västerlövsta, Lake Natsjön, 1936	1 Natsjön
5. Norrbotten: Hietaniemi, Kuotojärvi (Pennikajoki), 1940	105 Pennikajärvi
6. » Hietaniemi, Pallakka, 1940	109 Pallakkajärvi
7. » Korpilombolo, near Suaningi (Suaningijoki), 1940	129 Suaningijärvi
8. » Pajala, Kitkiöjärvi (Kitkiöjoki), 1940	103 Kitkiöjärvi
9. » Övertorneå, Svanstein, 1940	126 Kuitasjärvi
10. » Nederkalix, Kamlunge (Kalixälven), 1940	140 Kamlungeträsket
11. Dalarna: St. Tuna, Täkt, 1940	28 Sellnässjön
12. Norrbotten: Råneå, Strömsund, 1940	149 Dynträsket
13. Dalarna: By, Vatbo, 1936	30 Vatbosjön
14. » Husby, Lake Simonsbosjön, 1930, G. Lohammar	33 Simonsbosjön
15. » Husby, Lerhyttan, 1936	32 Kvensen
16. » Garpenberg, Dormsjö, 1936	36 Dormen
17. Norrbotten: Nederluleå, near Alviksträsk, 1940	156 Bälingsträsket
18. Uppland: Järlåsa, Östfora, 1935	2 Siggeforasjön
19. Norrbotten: Karl Gustav, Långbacken (Sangisälven) 1940	122 Lappträsk
20. » Pajala, Merasjärvi (Merasjoki), 1940	146 Merasjärvi

21.	Norrbotten: Nederkalix, near Pålänge, 1940	163	Stämsjön
22.	» Pajala, Kaunisvaara, 1940	164	Kaunisjärvi
23.	Dalarna: Folkärna, Östanfors, 1936	50	Halsjön
24.	» St. Skedvi, Djupdalen, 1932, 1936	60	Norshyttedammen
25.	» Grytnäs, Hyttan, 1932, 1936	52	Nävden
26.	» Gustafs, Milsbo, 1936	68	Ö. Milsbosjön
27.	Uppland: Västerlövsta, Molnebo, 1936	4	Vansjön
28.	Dalarna: Folkärna, near Fors, 1936	63	Sävviken
29.	» Gustafs, Björked, 1936	75	N. Milsbosjön
30.	Uppland: Skogstibble etc., Lake Strandsjön, 1940, G. E. du Rietz and Waern; 1941, G. Lohammar	6	Strandsjön
31.	» Tierp, Gryttjom (Tämnarån), 1937	11	Sörsjön
32.	» Knivsta, Kvarntorp, 1934, 1935	14	Säbysjön
33.	» » Noor, 1935	15	Valloxen
34.	» Rimbo, Alhamra, 1934, 1936	13	Metsjön
35.	» Söderbykarl, Rönsbol, 1934; Lake Erken 1941, G. Lohammar	18	Erken
36.	» Funbo, near the church, 1934, 1940	16	Funbosjön
37.	» Yttergran etc., Lake Ullevifjärden, 1934, M. Waern	20	L. Ullevifjärden
38.	» Bondkyrka etc., Lake Ekoln, 1934, M. Waern	17	Ekoln
39.	» Almunge etc., Lake Kärven, 1938, G. Lohammar	23	Kärven

Series L b.

40.	Dalarna: Boda, Kärfsåsen (Bysjöån), 1937, 1938	64	Bysjön
41.	» Rättvik, Enskvarn (Enån), 1934	70	Ensen
42.	» Leksand, Leksboda, 1937	77	Opplimen
43.	» Rättvik, Nittsjö, 1934	83	Nittsjön
44.	» » between Sätra and Nittsjö, 1934	84	Hosjön

Series E.

45.	Lule Lappmark: Jokkmokk, Vuollerim, Porsiforsen (Luleälven), 1940	9—31	Pajerim
46.	» » Jockkmokk, Vuollerimforsen (L. Luleälven), 1940	9—32	Storbacken
47.	Värmland: Nordmark, Finnmossen (Timsälven), 1938	108—238	Nordmark
48.	» Ekshärad, Sund (Klarälven), 1937	9—32	Storbacken
49.	Närke: Hidinge, beneath hill »223, 4» (Lekebergsån), 1937	61—132	Marieberg
50.	Småland: Annerstad, Skeen (Bolmån), 1941	98—215	Skeen
51.	Hälsingland: Bollnäs, Framnäs (Ljusnan), 1937	48—701	Framnäs
52.	Dalarna: Avesta, »Lasarettet» (Dalälven), 1934	53—122/332	Avesta

53.	Småland: Bottnaryd, near Bäckanäs (Älgån), 1941	101—1054	Lövrödjan
54.	Norrbotten: Övertorneå, Niska (Torneälven), 1940	1—8	Juoksengi
55.	Närke: Kvistbro, Backa (Svartån), 1941	61—131	Backa
56.	Blekinge: Mörrum, »Laxfisket» (Mörrumsån), 1941	86—186	Mörrum
57.	Småland: Ljungby (Lagan), 1941	98—208	Lagan
58.	» Bringetofta, Kornstad (Bringetoftaån), 1941	98—198	Bringetofta
59.	Jämtland: Ragunda, Hammarforsen (Indalsälven), 1948	40—89	Ragunda
60.	Halland: Vinberg, Tröinge (Ätran), 1941	103—974/226	Kila/Bällsforsen
61.	Småland: Mönsterås, Ämsfors (Ämån), 1941	74—178	Klämma
62.	Närke: Längbro, Lindbacka (Svartån), 1937, 1941	61—136	Karlslund
63.	Västergötland: Habo, Risbro (Dummeån), 1941	67—818	Risbro
64.	Halland: Ås, Åsbro (Viskan), 1941	105—227	Åsbro
65.	Jämtland: Hammerdal, Axås (Öjan), 1938	40—962	Gisselås
66.	Värmland: Väse, N. Ölmhult (Ölman), 1937	108—1019	Nybråta
67.	Östergötland: Vist, Hovetorp (Stångån), 1941	67—804	Bjärka-Säby
68.	Skåne: Färlöv, Torsebro (Helgeån), 1941	88—188	Kristianstad
69.	Södermanland: Nyköping, Karlfors (Nyköpingsån), 1941	65—148	N. Täckhammar
70.	Västergötland: Ullervad, Trilleholm (Tidan), 1941	108—244	Ullervad
71.	Skåne: Gråmanstorp, Klippan (Rönneån), 1941	96—192	Tranarp
72.	Östergötland: Svanhals, L. Kullen (Lorån), 1941	67—158	Kyleberg
	» Strå, Mjölna (Mjölnaån), 1941	67—706/160	Älvestad/Broby
74.	Uppland: Bälinge, Ulva (Fyris), 1934	61—878	Klastorp
75.	Skåne: Järrestad (Tommarpsån), 1941	88/89—1134	Gärsnäs
76.	» V. Hoby, Krutmöllan (Kävlingeån), 1941	92—189	Kävlinge

B. **Localities of Fig. 1 (p. 68).**

The chemical investigation includes only the specific conductivity. For each stream all samples were collected within a few hours on the same day and the determinations were made in the same evening in the laboratory.

The conductivity-figures ($\varkappa_{20} \cdot 10^6$) are in parentheses.

Dalarna: St. Tuna, Rivulet Lustbäcken west of Borlänge. Water-samples 27.6.1941.

77. At »Hyttbron» (21)
78. At »Timmerupplaget» (23.9)
79. Near Underberg
80. At the road-bridge east of Matsknuts (65.8)
81. Bäckelund, at the railway-bridge (105.0)
82. Trönö (122.0)

Uppland: River Jumkilsån west of Uppsala. Water-samples 2.7.1941.

83. Järlåsa, Morbolandet, the brook from Lake Ämsjön (44.6)
84. » Östfora, at the saw-mill (42.7)
85. Jumkil, near Stenviken (92.5)
86. » Vallhov (106.5)
87. Börje, Broby (198).

Appendix 2.

Lokalförteckning.

Localities of freshwater Florideae in Sweden (Swedish).

Majoriteten av insamlingarna härstammar från åar eller bäckar vid vägbroar eller i många fall kvarnar, sågar, elektricitetsverk eller dylikt, vilket i allmänhet icke särskilt angivits. I alla tillämpliga fall är därför, när det gäller mina egna kollekter, »i ån» resp. »bäcken», »vid landsvägsbron» resp. »kvarnen» etc. underförstått.

Förekommer efter årtalet ingen särskild beteckning, anger detta, att lokalen är min egen samt att materialet förvaras på Botaniska museet i Uppsala. För övriga insamlare och enskilda eller offentliga samlingar, vilka senare anförts inom parentes, ha nedanstående beteckningar använts.

B = O. Borge	K = H. Kylin	S = Stockholm (Riksmuseet)
C = G. R. Cedergren	L = Lund	T = Trondheim
DR = G. Einar Du Rietz	LA = Lund (Agardhs herbarium)	U = Uppsala (Bot. inst.)
G = Göteborg	Lh = G. Lohammar	UV = Uppsala (Växtb. inst.)
I = G. Israelson	N = O. Nordstedt	W = M. Wærn

Exsickat ha betecknats på följande sätt:

Aresch. = Areschoug, J. E., Algae Scandinaviceae exsiccatae. Ser. novae.
HR. = Hauck, F. et Richter, P., Phycotheca universalis.
Rab. = Rabenhorst, L., Die Algen Europas.
WNL. = Wittrock, V. et Nordstedt, O. (et Lagerheim, G.), Algae aquae dulcis exsiccatae.
Åkerm. = Åkermark, S., Typsamling av Skandinaviens alger.

Osäkra uppgifter ha satts inom klammer. Några få uppgifter, som tillkommit under tryckningen, ha ej kunnat införas på kartorna, vilket i varje särskilt fall angivits.

Agardhska herbariet i Lund har genomgåtts endast med avseende på batrachospermacéer.

Batrachospermum atrum

Skåne: Bosjökloster, Sätofta kvarn, ♂, ♀, 30.7. 1909, K (L, S, U). — Finja, Tyringe, 2.8. 1909, K (L, S, U). — Färlöv, Torsebro, Helgeån, 11.6. 1941. —

Färingtofta, Rägnaröd, bäcken efter vägen till Djupedal, 7.7. 1941. — Höör, ♂, ♀, 19.4. 1896, H. G. Simmons (G, L, U); 26.4. 1896, O. R. Holmberg (G, L, U); 23.8. 1903, N (WNL 1352); 30.7. 1909, K (L, S, U). — Hörja, Rökeån S Hågnarp, 7.7. 1941. — N. Sandby, Laxbromölla, 7.7. 1941, Lh (U) — V. Sönnarslöv, Hör, 8.7. 1941.

Blekinge: Lösen, Silltorpsån, C. Aspegren (LA, S). — Nättraby, Nättrabyån (Kylin 1912).

Kalmar län: Mönsterås, Ämsfors, 6.6. 1941. — Mölsta, 6.6. 1941. — Olmebäcken, 6.6. 1941.

Halland: Kvibille, Suseån, 9.7. 1941.

Bohuslän: Bäve, Eriksfors, 21.6. 1910, K (B, L, S, U). — Groröd, 24.8. 1935. — Kuröd, 24.8. 1935.

Dalsland: Högsäter, Tångelanda (Kylin 1912).

Västergötland: Sandhem, Svartån, 6. 1867, N (L).

Närke: Askersund, i Vättern utanför skogen strax N Dalängen på L. Hammarsundets SV. sida, 1.7. 1938, N. Stålberg (U).

Södermanland: Nacka, Nacka gård, 23.6. 1935.

Uppland: Forsmark, Berkinge, 15.6. 1936. — Knivsta, Kvarntorp, 8.6. 1935. — Läby, Ekebysjön, 7. 1857, J. E. Areschoug (S). — Rimbo, Alhamra, bäcken från Metsjön, 11.6. 1936. — Rö, Beateberg, bäcken från Angarn, 12.6. 1936. — Väddö, Gåsvik, 1.10. 1934. — Ortala, 13.6. 1937.

Gästrikland: Hille, Hille fäb., 24.8. 1937. — Hillevik, 19.6. 1936. — Österfärnebo, Sixbo, Norrån, 14.7. 1936.

Batrachospermum Boryanum

Skåne: Andrarum, Forsemölla, 11.8. 1935. — Benestad, 16.5. 1894, H. G. Simmons (G, L, S). — Skvattemölla bäck, 15.7. 1938, C (I, U). — Bläntarp—Everlöv, bäcken efter sockengränsen, 13.6. 1941. — Fulltofta, Ludvigstorp—Ramstorp, 28.7. 1935. — Färingtofta, Rägnaröd, bäcken efter vägen till Djupedal, 7.7. 1941. — Färlöv, Torsebro, 11.6. 1941. — Harlösa, 23.5. 1882, N (L). — Nära kyrkan, 11.8. 1935. — Höör, 31.7. 1909, K (U). — Ivetofta, Nymölla, 11.6. 1941. — Rödinge, Kurremölla, 22.7. 1935. — Veberöd, Hasslemöllan, 22.7. 1935. — V. Sönnarslöv, Hör, 8.7. 1941.

Blekinge: Sölvesborg, Sissebäck, 11.6. 1941.

Västergötland: Ledsjö, Dala, Mariedalsån, 12.7. 1941. — Vårnb, Brandstorp, Vårnbsbäcken, 12.7. 1941.

Närke: Vintrosa, Arvaby, 24.6. 1938.

Dalarna: Boda, Kärfsåsen, Bysjöån, 8.7. 1937. — Styggforsen, 16.6. 1934. — V. Boda—Styggforsen, 16.6. 1934. — Leksand, Leksboda, bäcken från Opplimen, 19.6. 1937. — Orsa, Kallholn, bäcken från Åbergatjärn, 17.6. 1934; 8.7. 1937; 17.7. 1938. — Skattungbyn, Tällingsån, 25.7. 1932; 17.6. 1934. — Ore, Dalbyn, Andån 16.6. 1934. — Rättvik, Ammtjärnsbäcken vid tegelbruket, 16.6. 1934. — Enskvarn, 15.6. 1934. — Bäcken från Nittsjön, 16.6. 1934. — Vikarbystrand Nittsjöån, 16.6. 1934. — V. Nittsjö, Nittsjöån, 25.8.1933; 16.6. 1934; 19.6. 1937.

Jämtland: Berg Svensta 2.8. 1938. — Frösö Fillstabäcken, 14.8. 1938. — Hammerdal, Gisselås, 11.8. 1938. — Håsjö, Singsån nedom Lillsjön, 12.8. 1938. — Klövsjö, S Klövsjöbyn, 14.8. 1938. — Rödön, Hismofors, 10.7. 1909, K (U).

Batrachospermum Boryanum var. *distensum*

Skåne: Brönnestad, Nösdala (Kylin 1912). — Brönnestad, Råbockamöllan, 7.7. 1941. — N. Mellby, Sandåkra, 7.7. 1941.

Småland: Ljungby, Lagan, 6.7. 1941. — Säby, Åsvalehult, 7.8. 1909, K (U).

Dalsland: Högsäter, Tångelanda, 30.7. 1910, K (U).

Västergötland: Utvängstorp, Tidan, 11.7. 1941.

Dalarna: Orsa, Enån, mellan sågen och kvarnen, 14.8. 1925, N. E. Svedelius (U). — Höglunda, 25.8. 1933; 8.7. 1937.

Härjedalen: Ljusnedal, Funna, 3.9. 1937.

Batrachospermum Crouanianum

Skåne: Höör, 19.4. 1896, H. G. Simmons (B,I,L,U); 4.6. 1896, K. Hirn (WNL 1356 b p. p.) — V. Sönnarslöv, Hör, 8.7. 1941.

Blekinge: Listerby, Listerbyån, 10.6. 1941. — Ronneby, nära Gärestad, 10.6. 1941.

Kalmar län: Söderåkra, Bruatorp, 9.6. 1941.

Småland: [Moheda, bäck, Kylin 1912, s. n. *B. anatinum*]. — Rydaholm, Sävrarp, 18.7. 1935. — Ryssby, Långhult, 5.7. 1941. — Ö. Torsås, Sunnansjö, kvarnrännan, 6. 1882, C. J. Johansson (B, S, U).

Bohuslän: Mo, nära Rämne, 24.8. 1935.

Dalsland: Järbo, Intagan, källa, 25.8. 1935.

Västergötland: Borås, 22.6. 1877, P. T. Cleve (WNL. 1006) s. n. *B. Boryanum* — Ornunga, 15.6. 1909, K (L, S, U). — V. Thunhem, Lindås, 26.8. 1935. — Vänersborg, Locknered, 31.5. 1883, A. G. Eliasson (B, L, S, U).

Närke: Hidinge, Villingsberg, 24.6. 1938.

Västmanland: Björskog, Östtuna, 23.6. 1938. — Ramnäs, Bruket, 16.6. 1937.

Värmland: Bjurtjärn, Alkvettern, bäcken från Trettondetjärn, 18.10. 1938. — St. Kil, Ekenäs, 2. 8. 1839, J. G. Agardh (LA). — Sunnemo, Munterhem, 17.10. 1938.

Dalarna: By, Tommesbo, 4.6. 1934. — Garpenberg, Borsbo, 4.6. 1934. — Idre, Idrebyn, skogsbäck efter Särnavägen, 16.7. 1933. — Lima, Kinnvallssjösätern, c. 510 m, 18.7. 1933. — Bäck mellan Limedsforsen och Ö. Lillmon, 15.8. 1932. — Malung, Tosklokmyrbäcken, 15.8. 1932. — Valleräs, 15.8. 1932. — Ore, Östanvik, 16.6. 1934. — Orsa, Bäcka, 17.6. 1934. — Tjärvasslan, 18.6. 1934. — St. Skedvi, Långbro källa, 25.9. 1932, 1.7. 1933, 18.8. 1933, 9. 5. 1937. — Svärdsjö, skogsbäck Böle—Vintjärn, 29.8. 1932. — Särna, Bålsjöbäcken efter Gördalsvägen, 500 m, 3.8. 1936. — Lillådalen, bäcken från Slättåstjärn, c. 700 m, 1.8. 1936.

Hälsingland: Enånger, Ö. Bälan, 20.6. 1936. — Hanebo, Sixbo, 22.6. 1936. — Arbrå, Koldemo, 17.8. 1938. — Färila, Svedja, 29.8. 1937. — Skogsbo, Långbo, 22.6. 1936.

Härjedalen: Sveg, i en bäck vid landsvägen öster om Härrö, 3.7. 1877, B (B). — Vemdalen, bäck mellan N. och S. Skalsfjällen, c. 700 m, 14.8. 1938.

Jämtland: Klövsjö, Risvallen, c. 650 m, 14.8. 1938.

Batrachospermum ectocarpum

Skåne: Brönnestad, Nösdala (Kylin 1912). — Råbockamöllan, 7.7. 1941. — Fulltofta, Ludvigstorp—Ramstorp, 28.7. 1935. — Höör, 4.5. 1876, K. E.

Hirn (WNL 1356 b p. p.); K (U). — Ån efter vägen till Maglasäte, 3.8. 1935. — Sätofta kvarn, 30.7. 1909, K (U). — Munkarp, Hålsaxbäcken, 3.8. 1935. — V. Sönnarslöv, Hör, 8.7. 1941.

Kalmar län: Gärdserum, Falerum, Storån, 9.8. 1941, Lh (U). — Lofta, Sågaretorp, 13.8. 1941, Lh (U).

Västergötland: Kinna—Vedum, Svartån nära kyrkan, 12.7. 1941. — Ullervad, Trilleholm, 12.7. 1941. — Vårnb, i en liten bäck på Billingen, 10.6. 1922, A. Hülphers (S).

Närke: Hovsta, Tjuse, Lillån, 23.6. 1938.

Södermanland: Grödinge, Norrga, ån vid landsvägsbron, 4.8. 1941, Lh (U). — Husbyrekane, Rosenfors, 11.9. 1938. — Härad, Eksågen, 11.9. 1938. — Sorunda, N. Källsta, 26.5. 1937; 4.8. 1941, Lh (U). — Svärta, Svärta gård, 18.8. 1941, Lh (U); 5.9. 1941. — Södertälje, Lina, 12.9. 1938. — Trosa, Trosakvarn, 19.8. 1941, Lh (U). — Trosa—Vagnhärad, Husby kvarn, 19.8. 1941, Lh (U). — Västerhaninge, Fors, 23.5. 1937; 1.8. 1941, Lh (U). — Ösmo, Hammersta, i ån vid avtagsvägen till Segersäng, 1.8. 1941, Lh (U). — Österåker, Forsån, 27.8. 1940, Lh (U). — Hulla kvarn, 7.9. 1941. — Skogakvarn, 7.9. 1941.

Uppland: Bondkyrka, Håga bro, i Hågaån, 8. 1868, J. E. Areschoug (S, T). — Kvarnbo, Hågaån, 9.9. 1911, K (L, S, U). — Lurbo bro, 17.7. 1934. — Bälinge, Högsta, Björklingeån, 13.7. 1878, V. Wittrock (S). — Målsta, 20.5. 1937. — Sundbro, 28. 10. 1936. — Tuna, 9.9. 1934. — Ulva, 9.9. 1934; 12.6. 1937. — Åloppe, 9.9. 1934. — Börje, Broby, 20.6. 1941. — Danmark, Falebro, 29.7. 1934. — Funbo, vid kyrkan, 29.9. 1934. — Söderby, 22.5. 1933; 3.6. 1933. — Gryta, Ransta, 13.9. 1934. — Jumkil, Vallhov, 9.9. 1934. — Tensta, Järsta, 23.8. 1937. — Tierp, Gryttjom, 6.7. 1937. — Ullfors, 6.9. 1941, Lh (U). — Tolfta, Strömsbergs bruk, 7.9. 1941, Lh (U). — Torstuna, Kungshusby, 15.6. 1937. — Uppsala, 30.8. 1868, J. E. Areschoug? (T). — Kvarnfallet, 19.8. 1909 etc., K (L, S, U). — Västerlövsta, Näbbo, 5.6. 1936. — Västland, Karlholm, 7.8. 1934; 16.6. 1936; 7.9. 1941, Lh (U). — Västlands kvarn, 23.8. 1937; 7.9. 1941, Lh (U). — Åland, Ålandskvarn, 5.6. 1936. — Östervåla, Åby, 24.10. 1936. — Österåker, Hacksta, 1.7. 1937. — Östuna, Hällby, 22.9. 1934.

Västmanland: Sevalla, Kinsta, 15.6. 1937. — Skultuna, Forsby, 16.6. 1937. —Skultunabruk, 1939 Lh (U). — Västerås, Svartån, 1939 Lh (U).

Dalarna: Grytnäs, Garphyttan, 7.9. 1932; 4.7. 1933; 24.12. 1934. — Grytnäs, Hyttan, 4.9. 1932; 28.6. 1936. — Hyttbäcken, 4.9. 1932. — Östanbyn, 4.9. 1932. — Gustavs, Björked, 27.6. 1936. — Milsbo, 27.6. 1936. — St. Skedvi, Ansta, 25.9. 1932. — Djupdalen, 27.8. 1932; 27.12. 1934; 27.6. 1936. — Landsbro, 25.9. 1932. — St. Tuna, Bäckelund, 26.6. 1936; 18.3. 1941. — Rågåker, 17.9. 1932. — Trönö, 26.6. 1936. — Vika, Färnviken, 25.9. 1932.

Gästrikland: Gävle, Vall, 24.8. 1937. — Torsåker, Särsta, 14.7. 1936.

Batrachospermum globosporum

Närke: Askersund, i viken strax N Edö herrgård vid Alsens S ände, 1938, N. Stålberg (U). — Hammar, i Vättern, 27.9. 1935 (Stålberg 1939, s. 48 s. n. *B. vagum* ssp. *flagelliforme*; U).

Dalarna: Folkärna, sjön Åsgarn, båtränna vid Kolarbo, 16.10. 1939, 5.10. 1941, Lh (U).

Gästrikland: Hille, Mårdängssjön, 8. 1940, Lh (U).

Batrachospermum moniliforme

Förekomst av f. *pyramidale* eller f. *densum* (som vanligen funnits växande tillsammans med den förstnämnda) har betecknats med *p* resp. *d*.

Skåne: Alnarp, 13.6. 1868, O. Nordstedt (L). — Finja, 1.8. 1909, K (U). — Fulltofta, Sätofta (Kylin 1912). — Färingtofta, Rägnaröd, efter vägen till Djupedal, 7.7. 1941. — Hardeberga, Fågelsång (LA); 28.4. 1860, F. Areschoug (L). — Höör, 23.4. 1893, B (B, L, U); i en bäck med klart, rinnande vatten, 19.4. 1896, K. Hirn (L); i ett nästan stillastående dike, 26.4. 1896, K. Hirn (L), O. R. Holmberg (G). — Efter vägen till Maglasäte, 3.8. 1935. — Hörja, Rökeån nära kyrkan, 7.7. 1941 *p*. — Rökeån S Hågnarp, 7.7. 1941 *d*. — Knislinge, Helgeån vid elverket, 7.7. 1941, Lh (U). — Lomma, Alnarp, 13.6. 1868, N (L). — Lund, Källby, källa, 13.5. 1867, N (B, G, L, S, U). — N. Sandby, Laxbromölla, forsen vid landsvägsbron, 7.7. 1941, Lh (U). — N. Svalöv (Kylin 1912). — Osby, 3.8. 1909, K (B, L, S, U) *d*. — Stehag, Rönnebro, 19.4. 1896, H. G. Simmons (B, L, U). — Svedala, Svedala mosse, 1932, B. Hylmö (L). — Sövde, Snogeholm, bäcken från Ellestasjön, 13.6. 1941. — V. Sönnarslöv, Hör, 8.7. 1941. — Rönneån vid landsvägsbron, 9.7. 1941, Lh (U) — Örkelljunga, Jägerholm, 7.7. 1941 *p*. — Ö. Broby, Glimminge, Helgeån, 7.7. 1941, Lh (U).

Blekinge: Karlskrona, C. Aspegren (U).

Öland: Böda, Byrum, 8.6. 1941.

Gotland: Alskog, N Rudviers kvarn, 25.5. 1937. — Boge, Vikers, 7. 1863, P. T. Cleve (S). — Eskelhem, Båticke, 25.5. 1937. — Gothem, Gothemsån (LA); 7. 1863, P. T. Cleve (U); 8.8. 1890, V. Wittrock (WNL 1355 b). — Hangvar, Irevik, 24.5. 1937. — Hörsne, 7. 1884, Alb. Nilsson (B, G, L, S, U). — Lummelunda, Överstekvarn, 24.5. 1937. — Lummelundsån, 6.8. 1890, V. Wittrock (WNL 1355 a). — Lärbro, Vasta, 24.5. 1937. — Stånga, Ungbåtels, 25.5. 1937.

Kalmar län: Arby, ån vid landsvägsbron c. 2 km N kyrkan, 15.7. 1941, Lh (U). — Mönsterås, Mölsta, 6.6. 1941. — Olmebäcken nära Stubbemåla, 6.6. 1941 *p*. — Ämsfors, 6.6. 1941 *p*. — Nybro (Kylin (1912). — Ryssby, ån vid bron c. 200 m S kyrkan, 16.7. 1941, Lh (U). — Söderåkra, Bruatorp, 9.6. 1941.

Småland: Alvestad (Kylin 1912) *d*. — Aneboda, Anebodabäcken c. 1300 m ovan utloppet i Stråken, 18.7. 1935 *d*. — Aringsås, L. Änganäs, ån vid en bro, 18.7. 1935 *p*. — Bottnaryd, Älgån nära Bäckanäs, 10.7. 1941 *p*. — Bringetofta, Kornstad, 4.7. 1941. — Hemmesjö, Skirsjön, G. F. Carlson (Kylin 1912). — Hjortsberga (Kylin 1912) *d*. — Sjöatorp, 18.7. 1935. — Hjälmseryd, Ivarsbygget, 18.7. 1935 *p*. — Ljungarum, Torpa, 4.7. 1869, O. Nordstedt (L). — Ljungby, Lagan, 6.7. 1941 *p*. — Moheda (Kylin 1912) *d*. — Markaryd, Ågård, på stenar i Lagan, 4.7. 1936, E. Julin (UV) *d*. — Mulseryd, Komosse, Björnbäcken, 25.6. 1936, C (U) *p*. — Nöbbeled, Ulvsåkraholm, i sjön Rottnen, 30.5. 1882, C. J. Johansson (WNL 1357). — Nöttja, Bolmaryd, 6.7. 1941 *p*. — Rydaholm, Sävrarp, 18.7. 1935 *d*. — Ryssby, Långhult, ån från Tjurken, 5.7. 1941 *p*. — Skatelöv, Huseby, 5. 1868, P. T. Cleve (S). — Slätthög, Bygget—Hullevik, 18.7. 1935. — Säby, Svartån NV kyrkan, 2.7. 1941. — Åsvalehult, 7.8. 1909, K (U). — Traryd, Strömsnäsbruk, Bökhultsbäcken, 6.7. 1941 *d*. — Unnaryd (S). — Ö. Torsås, Sunnansjö, i en bäck, 4. 1882, C. J. Johansson (U).

Halland: (LA). — Breared, Simlångens utlopp i Brearedssjön, på stenblock, 3.7. 1937, DR (UV). — Fylleån strax nedom utloppet ur Brearedssjön, ovan lands-

vägsbron, 7.7. 1937, DR (UV). — Kvibille, Suseån, 9.7. 1941 *p.* — Lindberg, Lindhov, 9.7. 1941. — Morup, Kvarngården, 9.7. 1941 *p.* — Varberg, Träslöv—Galtabäck 15.4. 1928; 5.10. 1930, D. E. Hylmö (I, L). — Träslövs N bäck, 20.5. 1928, D. E. Hylmö (I, L). — Fiskläget, 15.6. 1930, D. E. Hylmö (L). — Vinberg, Tröinge, Ätran, 9.7. 1941 *p.*

Göteborg: Landvetter, 7. 1869, J. E. Areschoug (S). — Styrsö, Vinga(?), 5.7. 1885, H. Strömfelt (S).

Bohuslän: Bäve, Eriksfors, 1.8. 1910, K (S, U). — Bäve, Fossum, 18.6. 1910, K (L, S, U). — Groröd, 24.8. 1935. — Kuröd, 24.8. 1935 *p.* — Mo, nära Rämne, 24.8. 1935 *p.* — Skaftö, 9. 1862 (S). — Skredsvik, Fränneröd, 24.8. 1935. — Tegneby, Nösund, »Kallkällan», 23.6. 1930, B. Hylmö (L). — Örgryte, vid Delesjön, 7.1841, J. E. Areschoug (Aresch. 11).

Dalsland: Bäcke, 30.7. 1910, K (U). — Dalskog, Ry, 25.8. 1935 *d.* — Högsäter, Tångelanda (Kylin 1912); Valboån, 25.8. 1935 *d.* — Järbo, St. Bön, 24.8. 1935. — Töftedal, Loviseholm, 24.8. 1935 *d.* — Åmål (Kylin 1912).

Västergötland: Borås, 15.6. 1877, P. T. Cleve (S). — Edsvära, Lidafors, på sten i Lidan, 10.8. 1938, N. Albertsson (U). — Habo, Risbro, 11.7. 1941 *p.* — Ljur, 21.6. 1869, K (U). — Marum, Flian nedom kyrkan, 12.7. 1941. — Nödinge, Surte, 7. 1874, F. R. Kjellman (S, U). — Ornunga, Ramnaklevsån, 17.6. 1909 (L, S, U). — Sandhem, Dintestorpsjön, 31.7. 1867, O. Nordstedt (L). — Grimstorp, Svinhagen, 27.5. 1867, N (L). — Slättäng, källa, 26.8. 1887, O. Nordstedt (L). — Skara, 7. 1809, Ax. Lidén (B, S, U). — Undenäs (Kylin 1912). — Utvängstorp, Tidan vid kyrkan, 11.7. 1941 *p.* — V. Tunhem, Lindås, 26.8. 1935. — Vänersnäs(?), Halleberg, ex. herb. N. Hofman-Bang (U).

Östergötland: Konungsund, Vadsbäcken, 30.6. 1941. — Skedevi, Tisenhult, 30.5. 1883, A. Grevillius (B, S, U). — St. Lars, bäck i Tinnerängen, 30.6. 1812 (LA).

Närke: Askersund, i Vättern utanför skogen strax N Dalängen på L. Hammarsundets SV sida, 1.7. 1938, N. Stålberg (U). — I viken strax N Edö herrgård vid Alsens S ända, 1938, N. Stålberg (U). — Glanshammar, Tjugesta, 23.6. 1938. — Hammar, i Vättern, 27.9. 1935, N. Stålberg (U). — Hidinge, Lekebergsån, 24.6. 1938 *d.* — Mårtenstorp, 24.6. 1938 *p.* — Längbro, Lindbacka, 24.6. 1938. — Tysslinge, Garphyttan, 24.6. 1938.

Södermanland: Hyltinge, Sparreholm, bäcken från Högsjön, 9. 9. 1941. — Kila, Viraån, S kyrkan, 16.8. 1941, Lh (U). — Landsort, 7. 1861, T. O. B. N. Krok (Aresch. 17). — Nacka, källan vid Danvikskrokar, 10. 1853 (U); 1.6. 1855, S. O. Lindberg (U); 1.5. 1857, Fr. Björnström (U); 6. 1856, P. T. Cleve (S); 5. 1858 (S). — Tunaberg, Nävekvarn, 17.8. 1941, Lh (U). — Österhaninge, nära Strömsund, 23.5. 1937 *p.*

Uppland: Alunda, Lunda, 14.6. 1936. — Bladåker, Kolarmora, 30.5. 1937. — Bondkyrka, Flottsund, i ett källflöde vid Ekoln, 10. 1909, Y. Ljunggren; 1910 (Cedergren 1913). — Flottsund, i en damm med stagnerande vatten, 1910 (Cedergren 1913). — Flottsund, vid stranden av Ekoln, 8. 1910 (Cedergren 1913)? s. n. *B. ectocarpum.* — Bondkyrka, Lurbo, 17.7. 1934. — Bälinge, Kallön, 5.7. 1936. — Ulva, 9.9. 1934. — Börstil, Lesum, 15.6. 1936. — Bäcken från Snäcksjön, 15.6. 1936. — Danmark, i en bäck vid Bergsbrunna, 1854, Ex. herb. H. von Post (S). — Bergsbrunna, källa, 7.2. 1937. — Edebo, Ronöholm, 30.5. 1937. — Enåker, vid landsvägsbron över Hallaren, 1.7. 1940, Lh (U). — Fastärna, Nykvarn, 11.6. 1936. — Forsmark, Berkinge, 5.9. 1926, S. Junell (U); 15.6. 1936. — Frö-

sunda, ån nära Fågelsunda, 29.6. 1937. — Gryta, Ransta, 13.9. 1934. — Harg, Hargs smedja, 15.6. 1936. — Långboda, 30.5. 1937. — Huddunge, bäcken från L. Fänsjön, 5.7. 1936. — Husbylånghundra, Åby, 11.6. 1936. — Häggeby, källa vid Bondkroken, 22.6. 1887, B (B, U). — Hökhuvud, Veddicka, 14.6. 1936. — Jumkil, Stenviken, 6.6. 1935. — Mörtsjön, 1940, DR (UV) — Järlåsa, Blackbo, 7.6. 1936. — Bäcken från Bredsjön, 5.6. 1936. — Blåviken, 5.7. 1936. — Grissjön, 1940, DR (UV). — Bäcken från Hålsjön, 9.6. 1935. — Morbolandet, 7.6. 1936; 6.5. 1937 *p.* — Bäcken från Ämsjön, 7.6. 1936. — Siggeforasjön, 13.9. 1941, Lh (U); 1940, DR (UV) — Östfora, 9.6. 1935 *p.*. — Knivsta, Forsby, 8.6. 1935. — Kvarntorp 8.6. 1935. — Noor, 8.6. 1935. — Lidingö, Gångsätra träsk, 28.6. 1856, O. Sandahl (U). — Mölna, 16.6. 1935. — Litslena, Skelsta, 23.6. 1938. — Lohärad, Kristineholm, Erken, 20.10. 1941, Lh (U). — Länna, Bergshamra, 12.6. 1936. — Nora, Åby, 24.10. 1936. — Östa, 24.10. 1936. — Norrby, Varmsätra, 2.6. 1937. — Rasbo, Hovgården, 14.8. 1934; 27.4. 1935. — Riala, Punskog, 12.6. 1936. — Sättermossen, 12.6. 1936. — Rimbo, Alhamra, 11.6. 1936. — Vallby, 22.9. 1934; 30.10. 1939, Lh (U). — Rådmansö, i en bäck vid Kapellskär, 26.6. 1900, B (B). — Skederid, Björkholmen, källbäck 11.6. 1936. — Skogs-Tibble, Strandsjön, 1940, W (UV) — Skokloster, Sko, 22.6. 1887, B (G), ej karterad. — Tegelsmora, Tobo, 16.6. 1936. — Tierp, Gryttjom, 6.7. 1937. — Tämnarån mitt för Styngsberg, 6.9. 1941, Lh (U). — Vendel, Kleringe, 6.7. 1937. — Väddö, i källan vid Gamla Grisslehamn, 12.6. 1889 etc., O. Borge (B, G, L). — Gåsvik, 1.10. 1934; 13.6. 1937. — I bäcken som utfaller i Sandviken, 7.6. 1889, B (B). — Vänge, Kvarnberg, 11.6. 1933. — Fibyån vid Dämmet, 29.5. 1935, R. Sernander (UV). — Västerlövsta, i källan vid torpet Byggningen, 8. 1869, C. Lenström (U). — Persbokällan, 8. 1869, C. A. E. Lenström (S). — Molnebo, 5.6. 1936; 2.7. 1941, Lh (U). — Åland, Ålandskvarn, 5.6. 1936. — Älvkarleby, Glamstorpen, 7.7. 1937. — Össebygarn, bäcken från sjön Hoven, 12.6. 1936. — Bäcken från Härsan, 12.6. 1936. — Ådra, 29.6. 1937. — Österlövsta, Hilleboda, 16.6. 1936. — Kyrkbyn, 15.6. 1936. — Lövsta bruk, 15.6. 1936. — I bäcken från Tarmsjön, 15.6. 1936. — Åkerby, 16.6. 1936. — Österåker, Ytterby, 1.7. 1937.

Västmanland: Arboga, i en källa vid Hallvardstorp, 6.8. 1888, B (B, G, U). — Björskog, Östtuna, 23.6. 1938. — Ervalla, Dyltakvarn, 23.6. 1938. — Fellingsbro, Essingån, 3.8. 1937. — Finnåker, 18.10. 1938. — Grythyttan, Grythyttehed, 17.6. 1937. — Gunnilbo, källa vid Gisslarboån, 16.6. 1937. — Gisslarboån, 16.6. 1937. — Nära Stjärnvik, 16.6. 1937. — Hjulsjö, Gränbäcken—Tosen, 16.6. 1937 *p.* — Hällefors, Sikfors, 26.7. 1911, K (U). — Lindesberg, Vedevåg, 24.7. 1910, K (L, S, U). — Ljusnarsberg, Östra Born, 25.7. 1910, K (L, S, U) *p.* — Norberg, Gäddtjärnsbäcken, 23.8. 1932 *d.* — Gäsjö, 23.8. 1932 *d.* — Svartån, 23.8. 1932 *d.* — Tackhärad, 6.6. 1934. — Ramnäs, Bruket, 16.6. 1937. — Nybrobäcken, 16.6. 1937. — Ramsberg, Björktjärnsbäcken, 16.6. 1937. — Heden, 16.6. 1937. — Hägernäs, 16.6. 1937. — Rällså, 16.6. 1937 *p.* — Sala, Josefsdal, 2.6. 1937. — Skinnskatteberg, Stripa, 16.6. 1937. — Skultuna, Bovallen, 16.6. 1937. — Forsby, 16.6. 1937. — Sevalla, Kinsta, 15.6. 1937. — Västerfärnebo, Rosshyttan, 24.7. 1936 *d.*

Värmland: Bjurtjärn, bäcken från Trettondetjärn, 18.10. 1938. — Brattfors, Svartå, 17.10. 1938. — Ekshärad, bäcken från Acksjön, 2.8. 1937. — Fryksände, Torsby, Röjdån, 26.6. 1938 *p.* — Ljusnan nära Enäs, 25.6. 1938 *d.* — Åshagen, 25.6. 1938 *p.* — Ekshärad, Götån, 30.6. 1938 *p.* — Sund, Klarälven, 2.8. 1937. — Vångån, 30.6. 1938 *p.* — Gustaf-Adolf, bäcken från Gunnerudstjärn, 28.6.

1938 *p.* — Bäcken från Lillsjön nära Lappmossåsen, 28.6. 1938 *p.* — Gåsborn, Kvarnen, 17.6. 1937 *p.* — Kristinehamn, vid Marieberg, 6.6. 1886, C. M. Broström (B, U) *p.* — Kroppa, Gammalkroppa, i Tvärälven, 1.8. 1806, G. Wahlenberg (U) *p.* — Lysvik, vid en såg i närheten av Gullerbyn, 25.6. 1938. — N. Finnskoga, Höljes, bäck, 30.6. 1938 *p.* — Tellåsen, Husbäcken, 30.6. 1938. — Varån, 1.8. 1937 *p.* — N. Ny, gren av Femtan, 1.8. 1937 *p.* — Halgån nedom Bäckelberget, 27.6. 1938. — Stöen, 30.6. 1938 *p.* — Värån, 30.6. 1938 *p.* — Nordmark, bäcken från stenbrottet vid kyrkbyn, 28.6. 1938. — Mokärrshyttan, G. Wahlenberg (S); på botten av vattenrännan, 29.7. 1804, G. Wahlenberg (U). — Timsälven vid Finnmossen, 17.10. 1938 *d.* — Sunne, Stopefors, 25.6. 1938 *p.* — S. Finnskoga, Bjurberget, Mangslidälven, 27.6. 1938 *d.* — Bograngen, Avensåsån, 27.6. 1938 *d.* — Grossmossen, bäcken från Laukalampi, 26.6. 1938 *d.* — Älgsjön, 27.6. 1938. — Vitsand, bäck nära Mellanberg, 27.6. 1938 *p.* — Väse, nära kyrkan, 24.6. 1938. — V. Ämtervik, ån från Aplungen, 25.6. 1938. — Älvsbacka, Östanås, 17.10. 1938 *p.* — Ölme(?), Aborrtjärn, 8.7. 1886, C. M. Broström (G). — Östmark, Nedre Röna, Rönaån, 26.6. 1938. — Vallen, bäcken från Arnsjön, 26.6. 1938.

Dalarna: Aspeboda, Mörtsjöbäcken, 8.8. 1932 *p.* — Stråtjärn, 8.8. 1932 *p.* — Avesta, Dalälven, 24.7. 1936. — Bjursås, Andersbo, 31.7. 1932 *d.* — Lustebo, (Kylin 1912). — Boda, Kärfsåsen, 8.7. 1937. — Styggforsen, 16.6. 1934. — By, Fallet, 15.9. 1932. — Horntorpet, 15.9. 1932. — Näckenbäck, 7.7. 1936. — Enviken, Björkboda, 7.8. 1932. — Björktjärnsbäcken, 7.8. 1932 *p.* — Skogsbäck nära Böle, 29.8. 1932; 7.8. 1932 *d.* — Dalbäcken, 26.6. 1934 *p.* — Lamborn, 26.6. 1934. — Bäcken från L. Mosan, 26.6. 1934. — Rönndalen, 7.8. 1932 *d.* — Törnstjärnsbäcken, 26.6. 1934. — Övertänger, 26.6. 1934. — Floda, Håvån, 7.6. 1934. — Käringforsen, 25. 7. 1936. — Bäcken från Tyren, 7.6. 1934. — Folkärna, båtränna i Åsgarn, vid Kolarbo, 16.10. 1939; 5.10. 1941, Lh (U). — Ån från Sävviken, 28.6. 1936. — Västanberg, Dammsjön, 5.10. 1941, Lh (U). — Gagnef, Högberget, 14.8. 1932 *p.* — Sifferbo, 13.8. 1933. — Österfors, 13.8. 1933. — Garpenberg, Finnhyttan, 7.9, 1932; 27.6. 1936 *d.* — Dormsjö, 27.6. 1936. — Herrgården, 24.12. 1934 *p.* — Persbo, 4.9. 1932; 7.9. 1932. — Grangärde, Hedtjärn, 6.6. 1934 *p.* — Kybäcken, 6.6. 1934 *p.* — Lastomberget, 6.6. 1934. — Loforsen, 24.9. 1935. — Norrboån, 6.6. 1934 *d.* — Ån från Storsjön, 7.6. 1934 *p.* — Grytnäs, Garphyttan, bäcken från Skinnarbosjön, 4.7. 1933. — Gustafs, Milsbo, 27.6. 1936. — Hedemora, Grådö, Dalälven, 10.7. 1933 *d.* — Hult, 25.8. 1932 *p.* — Bäcken från Ässen, 25.8. 1932 *p.* — Hosjö, Korsnäs, i ån, 2.1. 1937. *p.* — Husby, bäcken från St. Björktjärn, 12.8. 1932 *p.* — Born, 7.7. 1936. — Rosendal, 12.8. 1932 *d.* — Simonsbosjön, 7. 1940, Lh (U). — Bäcken från Kvensen, 7.7. 1936. — Idre, Häggsandet—Älvros, myrbäck, 16.7. 1933. — Långfjället, Foskån, c. 880 m, 6.8. 1936. — Storheden, 8.8. 1936. — Storsätern, 5.8. 1936. — St. Härjeån, 7.8. 1936. — Strömmen, 8.8. 1936. — Järna, Flatån, 14.8. 1932 *p.* — Gruckåkvarn, 14.8. 1932. — Hulån, 14.8. 1932 *d.* — Högbergets fäb.—Rämyrbacka, 26.7. 1936. — Snöån, 25.7. 1936; 14.8. 1932; 17.6. 1937 *d.* — Myrbäck nära Vansbro, 14.8. 1932 *d.* — Leksand, Aborrtjärnsbäcken, 17.8. 1933. — Heden, 7.7. 1925, N. E. Svedelius (U), 13.8. 1933. — Bäcken från Hobergstjärn, 23.7. 1932. — Bäcken från Skvin, 23.7. 1932 *p.* — Lima, Kinnvallssjösätern, 18.7. 1933. — Siktån, 18.7. 1933. — Vallsjöbäcken, 18.7. 1933. — Ludvika, Heden, 22.9. 1935. — Marnäs, 8.6. 1934. — Norrvik, 24.9. 1935. — Malung, Edet, 14.8. 1932. — Granåbron, 28.6. 1938. — Gärdan, 5.8. 1932. — Järsbubäcken, 27.6. 1938 *p.* — Megrinnsbäcken, 15.8. 1932; 25.7. 1936 *d.* — N. Mon, 15.8. 1932. — Ogströmmen vid utloppet ur Svansjön, 26.7. 1936. — Spjutbäcken, 14.8. 1932. —

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Norrbotten: Edefors, Edeforsen, 15.8. 1940. — Nedre Svartlå, 14.8. 1940. — Hietaniemi, Pennikajoki, 26.7. 1940. — B. fr. Pallakkajärvi, 26.7. 1940. — Littiäsoja, 26.7. 1940. — Karl Gustav, Lövheden, Matojoki, 25.7. 1940. — Ån fr. Rutajärvi, 26.7. 1940. — B. fr. Sorttijärvi, 26.7. 1940 *p.* — Korpilombolo, n. Suaningi, Suaningijoki, 29.7. 1940 *d.* — Sjön Pirtijärvi, 11.8. 1929, LH (BORGE 1939). — N. Teurajärvi, Finnijoki, 29.7. 1940 *d.* — Nederkalix, Kamlungeforsen, 21.7. 1940. — N. Pålänge, b. fr. Stämsjön, 22.7. 1940. — Näsby, b. Ö byn, 22.7. 1940. — Nederluleå, Avan, b. fr. Bälingsträsket, 20.7. 1940. — N. Alvikträsk, Bälingsträskets utlopp, 20.7. 1940. — Rutvik, b. fr. Bredmyrheden, 21.7. 1940. — Råneå-Börjelslandet, Norrmarkbäcken, 21.7. 1940 *p.* — Salmis, ytterst sparsamt i nordligaste delen av Bottniska viken vid Purras udde, 7. 1868, T. O. B. N. KROK (S; KROK 1870). — Aavajoki, 23.7. 1940 *p.* — Hakaoja, 25.7. 1940. — Pajala, Liviöjoki, 31.7. 1940 *d.* — Köngäsenkoski, 31.7. 1940. — B. fr. Kaunisjärvi, 1.8. 1940. — Ylinen Kihlangijoki, 1.8. 1940. — Kitkiöjärvi, Kitkiöjoki, 2.8. 1940. — Överluleå, Vittjärvs kvarn, 14.8. 1940. — Bredåker—Svartlå, skogsb. 27 km fr. Boden, 14.8. 1940. — Övertorneå, Kattilakoski, 28.7. 1940.

Lule Lappmark: Jokkmokk, Vuollerim, Porsiforsen, 16.8. 1940. — Lagnäsån eft. v. t. Kajkul, 16.8. 1940 *p.* — På stenar i Lagnäsån ej långt från Storbacken, 22.9. 1807, G. Wahlenberg (U) *p.* — Vuollerim, Vuollerimforsen, 16.8. 1940. — Koskats, Själlarim, b., 16.8. 1940. — Kyrkbyn, b. fr. Skabramsjöarna, 18.8. 1940. — Myrb. mell. Pärlälven och Appojokk, 18.8. 1940. — N. Klubbudden, b. fr. Seunnaksjöarna, 19.8. 1940. — Tjåmotis—Savvonselet, skogsb., 20.8. 1940. — Pårekplatån, b. mell. 2 småsjöar, 1.9. 1940. — Kvikkjokk—Sjabtjak, Tatajokk, 1.9. 1940. — Kyrkbyn, Akkatsfallen, 17.8. 1940.

Torne Lappmark: Jukkasjärvi, Kuosanen—Altajärvi, Siikajoki, 6.8. 1940. — Abisko, 1933, DR (UV). — Bäck S. Nuoljabäcken n. dess utlopp, 8.8. 1940. — B. på Nissontjårros N sluttning, c. 700 m. ö. h., 10.8. 1940. — Karesuando, Kelojoki, 3.8. 1940. — Myllyjoki, 3.8. 1940 *d.* — Ö grenen av Ainettijoki, 4.8. 1940 *p.* — Pahtakoski, 4.8. 1940. — V grenen av Ainettijoki, 4.8. 1940. — Idijoki, 4.8. 1940. — Lustojoki, 4.8. 1940. — Vittangi, b. fr. Ounistunturi, 5.8. 1940. — Kulijoki, 5.8. 1940 *p.* — Liukattijoki, 6.8. 1940.

Batrachospermum sporulans

Blekinge: Lösen, Silltorpsån, C. Aspegren (LA).

Gotland: Alskog, N Rudviers kvarn, 25.5. 1937. — Hangvar, Irevik, 24.5. 1937. — Lummelunda, Överstekvarn, 24.5. 1937. — Lärbro, Vasta kvarn, 24.5. 1937. — Norrlanda, Aurungs, 25.5. 1937. — Sanda, 18.5. 1824 (LA). — St. Karlsö, källa (Borge 1923). — Stånga, Ungbåtels, 25.5. 1937.

Småland: Hjortsberga, Sjöatorp, 18.7. 1935.

Dalsland: Järbo, Intagan, källa, 25.8. 1935.

Västergötland: Borås, 15.6. 1877, P. T. Cleve (L). — Grude (Kylin 1912). — Marum, Flian, nära kyrkan, 12.7. 1941. — Ornunga, 17.5. 1910, K (U). — Utvängstorp, Tidan nedom kyrkan, 11.7. 1941.

Uppland: Bälinge, Kallön, 5.7. 1936. — Börstil, bäcken från Markasjön, 14.6. 1936. — Söderby, 15.6. 1936. — Huddunge, bäcken från Fänsjöarna, 5.7. 1936. — Jumkil, Karlslund, bäcken från Kallsjön, 9.6. 1935. — Stenviken, 6.6. 1935. — Järlåsa, bäcken från Hålsjön, 9.6. 1935. — Morbolandet, 9.6. 1935. — Östfora, 9.6. 1935. — Lidingö, Mölna, 23.6. 1935. — Västerlövsta, Molnebo, 5.6. 1936.

Västmanland: Ramsberg, Heden, 16.6. 1937. — Rällså, 16.6. 1937. — Sala, Josefsdal, 2.6. 1937. — Skultuna, Bovallen, 16.6. 1937.

Värmland: Gåsborn, Kvarnen, 17.6. 1937. — S. Finnskoga, Våtsjöån, 27.6. 1938.

Dalarna: By, Horndal, 4.6. 1934. — Enviken, Dalbäcken, 26.6. 1934. — Bäcken från L. Mosan, 26.6. 1934. — Törnstjärnsbäcken, 26.6. 1934. — Folkärna, bäcken från St. Halsjön, 28.6. 1936. — Grangärde, Salån, 6.6. 1934. — Husby, Simonsbosjön, 7. 1940, Lh (U). — Idre, bäck på ostsidan av Fjätervålen, 8.8. 1936. — Långfjället, bäck 2 km N Barfredhågnas topp, c. 875 m, 6.8. 1936. — Leksand, Hedens kvarn, 16.6. och 7.7. 1925, N. E. Svedelius (U). — Malung, Ogströmmen vid utloppet ur Svanusjön, 26.7. 1936. — Norrbärke, Flatenberg, 6.6. 1934. — Ore, Lömån, 16.6. 1934. — Orsa, N Kvarnberget, 18.6. 1934. — Lindvasslan, 18.6. 1934. — Rättvik, Dådran, bergbäck efter Bingsjövägen, 17.8. 1933. — N. Blecket, Näsån, 15.6. 1934. — Årängsån, 15.6. 1934. — St. Tuna, Täkt, 26.6. 1936. — Sundborn, Gallsjön, 31.7. 1932. — Svärdsjö, Borrsjön, 13.7. 1936. — Söderbärke, Knutsbo, Älgsjöbäcken, 6.6. 1934.

Gästrikland: Hamrånge, Katrineholm—Fagervik, 19.6. 1936. — Svartån, 20.6. 1936. — Hille, Hillevik, 19.6. 1936. — Trödje, 19.6. 1936. — Gävle, Sikvik, 8.7. 1934. — Ockelbo, bäcken från Långsjön, 6.8. 1934.

Hälsingland: Alfta, Svabensverk, 26.6. 1934. — Bollnäs, Hällfors—Gruvberg, Stenån, 27.6. 1934. — Svartbo, 27.6. 1934. — Järvsö, bäcken från Mörtsjön, 21.6. 1936. — Ljusdal (Kylin 1912). — Njutånger, Njöte, 20.6. 1936. — Norrala, Nårby, 20.6. 1936. — Skog, Hästhagen, 22.6. 1936. — Söderala, nära Tönshammar, 20.6. 1936. — Voxna, Överbo, bäcken från Brynässjöarna, 31.7. 1938.

Härjedalen: Linsäll, Dalsvallen, 1.9. 1937. — Nära Sörvattnan, bäcken från tjärnen»767,3» c. 720 m, 8.8. 1936. — Valmen, 1.9. 1937. — Lillhärdal, Härjåbron—Risbrunn, 31.8. 1937. — Sveg (Kylin 1912).

Jämtland: Klövsjö, Risvallen, Röjan, c. 650 m, 14.8. 1938. — Sångbäcken, 600—650 m, 14.8. 1938. — Ragunda, Hammarforsen, 11.8. 1938. — Rätan, Kvarnsjöbäcken, 2.8. 1938. — Sunne, Hara, 14.8. 1938.

Ångermanland: Nordmaling, Levarbäcken, 29.6. 1931, L. Silén (U).

Norrbotten: Edefors, källb. ovan Haralds by, 15.8. 1940. — Edefors, b. n. Forsnäs, 15.8. 1940. — Nedertorneå, Hakaoja, 25.7. 1940.

Lule Lappmark: Jokkmokk, b. vid lappmarksgränsen eft. Boden-vägen, 15.8. 1940.

Batrachospermum vagum

Blekinge: Bräknehoby, Hoby, Simonsgölen, 18.8. 1889, N (L). — Nättraby, Gredby (U). — Nättrabyån, C. Aspegren (LA, S). — Ronneby, Bolebrosjön, 26. 6. 1884, N (L).

Småland: Aneboda, Lamhult, 21.9. 1868, N (L, S). — Skärsmogöl, 2.8. 1928 (I); 29.7. 1933, S. Lillieroth (U). — Lammen (Lillieroth 1938). — Annerstad, Hästasjön, 1938, DR (UV). — Bondstorp, Ö. Tvesjön, 1920 (Lundquist 1923). — Femsjö, 7. Elias Fries (LA). — Gårdsby, Sandsbro, myrdike, 30.8. 1931, G. R. Cedergren (I). — Hjortsberga, Sjöatorp, 18.7. 1935. — Hjälmseryd, Ivarsbygget, 18.7. 1935. — Hovmantorp, Lillasjön, G. W. F. Carlson (Kylin 1912). — Högsby? Huseby, 5. 1868, P. T. Cleve (S). — Jönköping, Strömsberg, 5.6. 1870, N (T); 1876 etc. N (L). — Långasjö, Råamålagölen (Thunmark 1938). — Moheda, i sjön Fiolen (Thunmark 1931). — Mulseryd, Komosse, Åsebogölarna, 17.8. 1917, H. Osvald (UV). — Slätthög, Lindhults göl, 11.8. 1936, B. Åberg (U). — Stenbrohult? Möckeln, 1865, N. J. Scheutz (U). — Svennarum, Fiskeby, 1864, P. G. Theorin (G, U). — Unnaryd, 1864, Theorin (S).

Halland: Breared, strax Ö om Högarydsås, bäck i kärr N om landsvägen, 20.7. 1936, DR (UV). — Släp, Kivik, 6. 1889, Carl Hjärne (I, L, U). — Varberg, Veddinge, 3.6. 1930, B. Hylmö (L).

Göteborg: (T); S. Åkerman (Rab. 1945); Hisingen, S. Åkerman (Aresch. 258).

Bohuslän: Hede, Borgsjön, 29.7. 1876, N (S). — Lur, kärr bredvid Aborrsjön, 8.8. 1876, N (S). — Mellan Käringsjön och Sölesjön, 8.8. 1876, N (L, S). — Lyse, i en torvmosse på berget vid Häggvall, 24.8. 1876, N (S). — Mo, Kynnefjäll, Ristelångvattnet, 1.8. 1876, N (L, S). — Naverstad, Aborrtjärn, 9.8. 1876, N (S). — Fagerhult, 5.8. 1876, N (WNL. 1). — Romelanda, Honäbba nära Gräsås, 12.7. 1876, N (S). — Skee, Vettelanda,i Silvattnet ovan Holmen, 13.7. 1876, N (S).

Dalsland: Gunnarsnäs, Hjulsängen, 31.7. 1868 etc., V. Wittrock (WNL 103). — Töftedal, Loviseholm, i Kynne älv, 24.8. 1935.

Västergötland: Ornunga, 17.5. 1910 etc., K (L, S, U). — Skallsjö, Floda, Ljungsmossen vid Dräng sered, 14.6. 1870, N (L). — Vilsekleva, Mösseberg, Bergsjön, 27.6. 1890, N (L). — Våmb(?), Billinge, Blängsmossen, slurkhål i planets S sluttning, 1941, DR (UV). — V. Tunhem, Hunneberg, Långvattnet, 3.8. 1933, A. Hülphers (S).

[**Östergötland:** Svanhals, bland Equisetum vid Renstad, B, det. H. Kylin (Borge 1921)].

Södermanland: Utö, Ö sidan mellan stora och lilla Sillvik, hällmarkssjö, 19. 8. 1931, DR (UV) ej på kartan fig. 18.

Uppland: Djurö, sjön V om Kvarnsjön vid Stavsnäs, 9.9. 1905, B (B). — Järlåsa, Siggeforasjön, 9.9. 1939; 13.9. 1941, Lh (U). — Huddunge, Fänsjöbäcken, 5.7. 1936. — Värmdö, Krokträsket, 23.8. 1896, K. Bohlin (WNL. 1304). — Västerlövsta, Natsjön, 5.6. 1936; 1.9. 1937, Lh (U).

Västmanland: (LA) — Norberg, Gäsjö, 23.8. 1932.

Värmland: Gustaf-Adolf, Geijersholm, i en damm nära Uvån, J. Lagergren, 5. 1865 (S). — I en skogsbäck nära Gustafsfors, 7. 1854, N. C. Kindberg (S). — Bäcken från Lillsjön nära Lappmossåsen, 28.6. 1938. — N. Finnskoga, Höljes bäck, 26.6. 1923, A. Hülphers (S). — N. Ny, Halgån nedom Bäckelberget, 27.6. 1938. — Sågbäcken, Stöen, 30.6. 1938. — Gren av Femtan, 1.8. 1937. — Nordmark, Timsälven, c. 150 m, 17.10. 1938. — S. Finnskoga, Bograngen, Avensåsån, 27.6. 1938. — Våtsjöån, 27.6. 1938. — Älgsjön, 27.6. 1938. — St. Kil, Ekenäs, 25.7. 1839 etc., J. G. Agardh (LA). — Vitsand, Järnbergsås, Vägan, 27.6. 1938. — Älvsbacka, Östanås, 17.10. 1938.

Dalarna: Bjursås, Andersbo, 31.7. 1932. — Grangärde, Storsjöån, 7.6. 1934. — Grytnäs, Skinnarbo, 4.7. 1933. — Hedemora, Norn, 25.8. 1932. — Sandsätersbro, Långtjärn, 1928. — Turbo, Angerstein (S). — Idre, bäcken från L. Karlmorstjärn, 680 m, 7.8. 1936. — Järna, Gruckåkvarn, 14.8. 1932. — Vansbro, 14.8. 1932. — Lima, Mosätra, 10.6. 1919 C (G). — Tandövala (Cedergren 1926). — Vassåtjärn (Cedergren 1926). — Äppelrostjärn (Cedergren 1926). — Malung, Granåbron, 28.6. 1938. — Jägra, Örartjärnsbäcken, 28.6. 1938. — Järsbubäcken nedom Fageråsen, 27.6. 1938. — Ore (Kylin 1912). — Orsa, Lindvasslan, 18.6. 1934. — Bäcken från Långtjärn N Ämådalen, 18.6. 1934. — Bäcken från Hevoslampi, 1.8. 1938. — Rättvik, Bodån, 17.7. 1938. — St. Tuna, Baggbo, 11.4. 1938; 9.8. 1932. — Hytting—Högberget, 9.5. 1937. — Svärdsjö, Borrsjön, 13.7. 1936. — Bäcken till Kvarntjärn, 17.8. 1933. — Laxbäcken, 29.8. 1932. — Säfsnäs, Fredriksberg—Tyfors, bäcken vid »320, 5» 23.9. 1935. — Fredriksberg—Tyfors, bäcken vid »Gillerdrågen», 23.9. 1935. — Stentjärnsbäcken, 7.6. 1934. — Stenälven, 23.9. 1935. — Tyfors, Rödälven, 23.9. 1935. — Ulriksberg, 22.9. 1935. — Bäcken från Älgsjön, 23.9. 1935. — Särna, Näckån, 16.8. 1932. — Söderbärke, Nässarbäcken efter vägen till Norn, 25.8. 1932. — Vänjan, Aspan, 26.7. 1936.

Gästrikland: Hamrånge, Skäggarn, 12.7. 1937, Lh (U). — Svartån, 26.8. 1937. — Ockelbo, Bräntholmstjärnsbäcken, 29.8. 1932. — Hällbäcken, 29.8. 1932; 6.8. 1934.

Hälsingland: Alfta, bäcken från Ulvatjärn, 1937, Lh (U). — Bollnäs, bäcken från Örjungen, 8. 1937, Lh (U). — Forsa, Vallaberget i en bäck, 7. 1878, Chr. Aurivillius (S). — Färila, Kårböleskog, Stensjöbäcken, 1.8. 1938.

Härjedalen: Hede, Ortholmen, 1915 (Cedergren 1932). — I sjön Rörsjön, 1914 (Cedergren 1932). — Sveg (Kylin 1912). — Tännäs, Funäsdalsberget, c. 900 m, 13.7. 1914 C (S). — Vemdalen, Sörvemån, 1913 (Cedergren 1932). —

Vånstötvallen, 20.7. 1914 etc., C (G, L, U, UV). — Tännäs, i sjön Rogen, 1919 (Cedergren 1932).

Jämtland: Åre, Handöl, B (Kylin 1912).

Medelpad: Haverö, Sottorpet (Cedergren 1938).

Ångermanland: Grundsunda, Svartvattnet, 30.8. 1935, G. B. E. Hasselberg (U). — Nordmaling, Ava, Stribäcken, 26.7. 1935, G. B. E. Hasselberg (U). — Näske, i en bergbäck på Kryken(?), T. O. B. N. Krok (S). — Nätra, Stortjärn, vid Vårdkasberget, 3.8. 1935, G. B. E. Hasselberg (U). — Tåsjö, Mikelstjärn, 11.8. 1927, C (B, G, I, L).

Västerbotten: Bygdeå, Rataskär, i en tjärn, 8. 1868, T. O. B. N. Krok (S).

Norrbotten: Nederluleå, n. Alvikssträsk, Bälingsträskets utlopp, 20.7. 1940.

Pite Lappmark: Arvidsjaur, i en bäck, 23.6. 1856, Fr. Björnström och S. Lindberg (S, U).

Lule Lappmark: Jokkmokk, Sareks nationalpark, Pårekjaure (Ström 1923). N Säkojokk (Ström 1923).

Torne Lappmark: Jukkasjärvi, dammar vid sjön Vassijaure, 6.8. 1910, B (B, S, L). — Karesuando, n. Kuttainen, Myllyjoki, 3.8. 1940.

Batrachospermum virgato-Decaisneanum

Skåne: Lomma, Alnarp, i ett kärr på ruttnad brygga, 13.6. 1868, N (L). — N. Nöbbelöv, Nöbbelövs mosse, 8. 1832, J. Agardh (LA).

Batrachospermum virgatum

Skåne: Brönnestad, Nösdala (Kylin 1912). — Finja, Tyringe (Kylin 1912). — Höör, 31.7. 1909, K (L, S, U). — Kärrarp, 3.8. 1935. — Hörja, Rökeån nära kyrkan, 7.7. 1941. — Munkarp, Hålsaxbäcken, 3.8. 1935.

Kalmar län: Söderåkra, Bruatorp, 9.6. 1941.

Småland: Berg, Hjulatorp, 4.7. 1941. — Ryssby, Strättö, 5.7. 1941. — Växjö, i stagnerande vatten 26.4. 1930, (Cedergren 1938 b).

Halland: Lindberg, Lindhov, Himlaån, 9.7. 1941. — Varberg, Träslövs Fiskläge, 15.6. 1930, D. E. Hylmö (I, L). — Träslövs N. bäck, 4.7. 1930, D. E. Hylmö (L).

Bohuslän: Bäve, Eriksfors, 1.8. 1910, K (U). — Groröd, 21.6. 1910, K (U).

Dalsland: Dalskog, L. Halängen, 25.8. 1935. — Åmål, K (Kylin 1912).

Västergötland: Kinna-Vedum, Svartån nära kyrkan, 12.7. 1941.

Östergötland: Heda, Disevid, 2.7. 1941. — Strå, Mjölna, 2.7. 1941. — Torpa, nära Forsuma, 11.9. 1938.

Närke: Gällersta, Almbro, 8.9. 1941. — Hovsta, Tjuste, Lillån, 23.6. 1938. — Längbro, Lindbacka, 24.6. 1938.

Södermanland: Barna, nära Nabbtorp, 11.9. 1938. — Brännkyrka, L. Sikla, 23.6. 1935. — Gryt, Stjärnhov, 9.9. 1941. — Husbyrekane, Rosenfors, 11.9. 1938. — Hyltinge, Sparreholm, bäcken från Högsjön, 9.9. 1941. — Härad, Eksågen, 11.9. 1938. — Kila, Horsbråten, 6.9. 1941. — Stavsjökvarn, 6.9. 1941. — Virån S kyrkan, 6.9. 1941. — L. Mellösa, Stocktorp, 9.9. 1941. — Länna, Lännabruk, 23.9. 1940, Lh (U). — Lästringe, Tuvekvarn, 5.9. 1941. — Salem, Högantorp, 12.9. 1938. — Sköldinge, Varbro, 9.9. 1941. — Svärta, Svärta gård, 18.8. 1941, Lh (U); 5.9. 1941. — Taxinge, vid kyrkan, 12.9. 1938. — Toresund, Kvarntorp,

11.9. 1938. — Trosa, Trosakvarn, 19.8. 1941, Lh (U). — Trosa—Vagnhärad, Husby kvarn, 19.8. 1941, Lh (U); 5.9. 1941. — Tuna, Fadekvarn, 6.9. 1941. — Åker, Björnnäs, 12.9. 1938. — Österåker, Skogakvarn, 7.9. 1941.

Uppland: Alunda, Lunda, 14.6. 1936. — Bälinge, Sundbro, 28.10. 1936. — Tuna, 9.9. 1934. — Film, bäcken från Stordammen, 16.6. 1936. — Gryta, Ransta, 13.9. 1934. — Husbylånghundra, Åby, 11.6. 1936. — Jumkil, Stenviken, 6.6. 1935. — Vallhov, 9.9. 1934; 6.6. 1935. — Kårsta, Backa, 29.6. 1937. — Lohärad, Kristineholm, 2.10. 1934. — Länna, Bergshamra, 30.9. 1934. — Nora, Aby, 24.10. 1936. — Riala, vid kyrkan, 30.9. 1934. — Sättermossen, 12.6. 1936. — Rimbo, Alhamra, 22.9. 1934. — Roslagskulla, Lo, 30.9. 1934. — Skederid, Finsta, 22.9. 1934. — Lädinge, 30.9. 1934. — Skogstibble, Strandsjön, 20.9. 1941, Lh (U). — Tensta, Järsta, 23.8. 1937. — Tierp, Gryttjom, 6.7. 1937. — Väddö, Gåsvik, 1.10. 1934. — Västerlövsta, Molnebo, 5.6. 1936. — Åkerby, Uggelstad, 28.10. 1936. — Åland, Ålandskvarn, 5.6. 1936. — Össebygarn, bäcken från Härsan, 12.6. 1936. — Österlövsta, Hilleboda, Strömarån, 16.6. 1936. — Östervåla, Åby, 24.10. 1936. — Österåker, Nykvarn, 1.7. 1937. — Östuna, Hällby, 22.9. 1934.

Västmanland: Fellingsbro, Essingån, 3.8. 1937. — Gunnilbo, nära Stjärnvik, 16.6. 1937. — Sevalla, Kinsta, 15.6. 1937. — Skultuna, Forsby, 16.6. 1937. — Skultunabruk, 1939 Lh (U).

Värmland: Grums, 28.7. 1910, K (U). — Väse, N. Ölmhult, Ölman, 28.6. 1938. — Frykerud, Fagerås, 28.7. 1910, K (U).

Dalarna: By, Hede, 7.7. 1936. — Grytnäs, Hyttan, 4.9. 1932. — Östanbyn, 4.9. 1932. — Husby, Ansta—Djupdalen, 31.8. 1932. — St. Skedvi, Ansta, 25.9. 1932. — Djupdalen, 27.8. 1932; 27.12. 1934; 27.6. 1936. — Landsbro, 25.9. 1932. — St. Tuna, Rågåker, 17.9. 1932; 30.6. 1933. — Trönö, 26.6. 1936.

Gästrikland: Gävle, Vall, 24.8. 1937. — Hedesunda, Ölbo, 30.7. 1938. — Ovansjö, Backberg, 24.8. 1937. — Torsåker, Prästhyttan, 30.7. 1938. — Särsta, 14.7. 1936. — Valbo, Nybro, 7.7. 1937.

Hälsingland: Arbrå, Koldemo, 17.8. 1938. — Delsbo, Långsbo, 16.8. 1938. — Färila, Svedja, 29.8. 1937. — Ovanåker, M. Roteberg, Ljustjärnsbäcken, 31.7. 1938.

Batrachospermum vogesiacum

Bohuslän: Krokstad, Kynnefjäll, myrbäck, 1.8. 1876, N (WNL 102).

Västergötland: V. Tunhem, i bäcken som förenar sjöarna Eldmörjan och Bergsjön uppe på Hunneberg, 2.8. 1812, G. Wahlenberg (LA).

Värmland: N. Finnskoga, Husbäcken, 1.8. 1937; 30.6. 1938. — [Varnum, mellan Östra mossen och Björneborg, 1.7. 1886, C. M. Broström (Kylin 1912)].

Dalarna: Särna, Fulufjäll, Harrsjöån, 890 m, 2.8. 1936.

Härjedalen: Linsäll, nära Sörvattnan, bäcken från tjärnen »767,3», 720 m, 8.8. 1936; 3.9. 1937.

Chantransia Hermanni

Skåne: Andrarum, Forsemölla, 11.8. 1935. — Brönnestad, Råbockamöllan, 7.7. 1941. — Degeberga, Forsakar, 12.6. 1941. — Fulltofta, Ljungstorp—Ludvigstorp, 28.7. 1935. — Ludvigstorp—Ramstorp, 28.7. 1935. — Färingtofta, Rägnaröd, 7.7. 1941. — Färlöv, Torsebro, 11.6. 1941. — Genarp—Gödelöv, Höjeån, 4.8. 1935. — Gråmantorp, Klippan, Bäljaneån, 8.7. 1941. — Klippan, Rönneån, 8.7.

1941. — Hjärnarp, Stendal, 8.7. 1941. — Höör, 19.4. 1896, H. G. Simmons (B, L). — Sätofta, 28.7. 1935; 3.8. 1935. — Hörby, Osbyholm, 28.7. 1935. — Hörja, nära kyrkan, Rökeån, 7.7. 1941. — S Hågnarp, Rökeån, 7.7. 1941. — Ivetofta, Nymölla, Skräbeån, 11.6. 1941. — Järrestad, Tommarpsån, 12.6. 1941. — Maglehem, Julebodaån, 12.6. 1941. — N. Mellby, Sandåkra, 7.7. 1941. — Rörum, nära Ströntemölla, 11.8. 1935. — Vollsjö, vid järnvägsbron, 11.8. 1935. — V. Hoby, Krutmöllan, 11. 1937 (Levring 1938); 14.6. 1941. — V. Sönnarslöv, Hör, bäck, 8.7. 1941.

Blekinge: Listerby, Listerbyån, 10.6. 1941. — Mörrum, Mörrumsån, 10.6. 1941. — Nättraby(?), Nättrabyån, 1821(?) C. Aspegren (S). — Ronneby, nära Gärestad, 10.6. 1941. — Sölvesborg, Sissebäck, 11.6. 1941.

Kalmar län: Hagby, Hagbytorp, ån vid landsvägsbron, 15.7. 1941, Lh (U). — Hossmo, Binga, 9.6. 1941. — Ljungby, Kölby kvarn, 15.7. 1941, Lh (U). — Mönsterås, Ämsfors, 6.6. 1941.

Småland: Annerstad, Skeen, 6.7. 1941. — Bellö, Bolstra, 3.7. 1941. — Berg, Hjulatorp, 4.7. 1941. — Bringetofta, Kornstad, 4.7. 1941. — Hjälmseryd, Brohult, 4.7. 1941. — Näsby, Hällinge, Åmån, 4.7. 1941. — Skede, Brunnshult, 3.7. 1941. — Söraby, Stockökvarn, 4.7. 1941.

Halland: Kvibille, Suseån, 9.7. 1941. — Ränneslöv(?), Ränneslövsån (S). — Tvååker, Björkäng, 9.7. 1941. — Ås, Åsbro, Viskan, 9.7. 1941.

Göteborg: Areschoug (Aresch. N:o 74). Backa(?), Lärje, 6. (B).

Bohuslän: Bäve, Groröd, 24.8. 1935. — Kuröd, 24.8. 1935.

Dalsland: Gesäter, Rölandaån, 25.8. 1935. — Högsäter, Svingån, 25.8. 1935. — Ör, Åsmule, 25.8. 1935.

Västergötland: Sandhem, Svartån, 11.6. 1867, N (B, S, U). — S. Ving, Bogakvarn, 10.7. 1941. — Ullervad, Trilleholm, 12.7. 1941. — Utvängstorp, Tidan nedom kyrkan, 11.7. 1941.

Östergötland: Ekeby, Boxholm, 2.7. 1941. — Ledeberg, Odensfors, 1.7. 1941. — Linköping, Tinnerbäcken, 1.7. 1941. — Norrköping, Norrköpings ström, Arosenius(?) (R). — Svanhals, L. Kullen, 2.7. 1941. — Vist, Hovetorp, 1.7. 1941.

Närke: Vintrosa, Arvaby, 24.6. 1938. — Längbro, Karlslund, 8.9. 1941. — Kvistbro, Backa, 8.9. 1941.

Södermanland: Husbyrekane, Rosenfors, 11.9. 1938. — Härad, Eksågen, 11.9. 1938. — Kila, Virån S kyrkan, 6.9. 1941. — Horsbråten, 6.9. 1941. — Lästringe, Tuvekvarn, 5.9. 1941. — Nacka, Nacka gård, 23.6. 1935. — Nyköping, Karlfors kvarn, Nyköpingsån, 18.8. 1941, Lh (U); 6.9. 1941. — Sköldinge. Varbro, 9.9. 1941. — Trosa, Husbykvarn, 5.9. 1941. — Trosakvarn, 19.8. 1941, Lh (U). — Västerhaninge, Fors, 23.5. 1937. — Ö. Vingåker, Genne, 9.9. 1941. — Ösmo, N. Fors, 23.5. 1937.

Uppland: Alunda, Lunda, 14.6. 1936. — Bälinge, Målsta, 1.6. 1936; 20.5. 1937. — Tuna, 9.9. 1934. — Ulva, 7.6. 1864 etc. V. Wittrock (S, U); 1870 etc., W. Berndes (U); 8.11. 1938. — Åloppe, 9.9. 1934. — Börje, Broby, 4.7. 1936. — Börstil, Lesum, 15.6. 1936. — Forsmark, Berkinge, 15.6. 1936. — Harg, Hargssmedja, 15.6. 1936. — Härnevi, Vånsjöbro, 15.6. 1937. — Hökhuvud, Veddicka, 14.6. 1936. — Jumkil, Stenviken, 6.6. 1935. — Vallhov, 9.9. 1934; 3.5., 12.6. 1937. — Länna, Bergshamra, 30.9. 1934; 12.6. 1936. — Penningby, 30.9. 1934. — Rimbo, kvarnen SV kyrkan, 22.9. 1934. — Roslagsbro, Bredsätra, 23.9. 1934. — Roslagskulla, Lo, 30.9. 1934. — Simtuna, Högby, 15.6. 1937. — Tensta, Järsta, 23.8. 1937. — Tierp, Gryttjom, 6.7. 1937. — Ununge, Skede, 1.10. 1934. — Uppsala,

i Fyris, 6. F. S. Areschoug (Aresch. 232); (Åkerm. 17); i Islandsfallet, 6.7. 1878, V. Wittrock (WNL 304, p. p., p. p. *Pseudochantransia chalybaea*). — Väddö, Gåsvik, 1.10. 1934. — Västland, Karlholm, 16.6. 1936. — Västlands kvarn, 23.8. 1937. Västerlövsta, Molnebo, 5.6. 1936. — Ärentuna, Rostad, 3.6. 1936.

Uppland: Österlövsta, Hilleboda, 16.6. 1936. — Lövstabruk, 15.6. 1936. Österåker, Hacksta, 1.7. 1937.

Västmanland: Arboga, Arbogaån, 3.8. 1937. — Björskog, Stenvad, 23.6. 1938. — Östtuna, 23.6. 1938. — Ervalla, Dyltakvarn, 23.6. 1938. — Fellingsbro, Finnåker, 18.10. 1938. — Grythyttan, Grythyttehed, 17.6. 1937. — Gunnilbo, Gisslarboån, 16.6. 1937. — Järnboås, nära Stjärnvik, 16.6. 1937. — Rastälven vid Pettersfors, 2.8. 1937. — Köping (S). — Ramnäs, Bruket, 16.6. 1937. — Skultuna, Forsby, 16.6. 1937. — Säterbo, på mossa på stenar i gamla »Hjälmare kanal», 29.7. 1888, B (HR 738).

Värmland: Bjurtjärn, bäcken från Trettondetjärn, 18.10. 1938. — Brattfors, Svartå, 17.10. 1938. — Fryksände, Torsby, bäcken från Vassjön, 26.6. 1938. Åshagen, 25.6. 1938. — Glava, Hb. Düben (L). — Lungsund Bjurbäcken, Ljungsälven, 17.10. 1938. — Nyed, Norums bruk, i älven, 24.6. 1899, A. Hülphers (L). Väse, vid kyrkan, 24.6. 1938. — V. Ämtervik, ån från Aplungen, 25.6. 1938. Östmark, Vallen, bäcken från Arnsjön, 26.6. 1938.

Dalarna: Avesta, Dalälven, 24.7. 1936. — Boda, Styggforsen, 16.6. 1934. — By, Tommesbo, 4.6. 1934. — Bäcken från Vatbosjön, 7.7. 1936. — Enviken, Lamborn, 26.6. 1934. — Övertänger, 26.6. 1934. — Garpenberg, Borsbo, 4.6. 1934. — Dormsjö, 27.6. 1936. — Finnhyttan, 27.6. 1936. — Grytnäs, Hyttan, 28.6. 1936. — Garphyttan, 24.12. 1934. — Gustafs, Milsbo, 27.6. 1936. — Husby, Lerhyttan, bäcken från Kvensen, 7.7. 1936. — Idre, Foskån, 880 m, 6.8. 1936. — Bäck nedom Barfredhågna, 875 m, 6.8. 1936. — Storheden, Foskån, 590 m, 8.8. 1936. — Storån, efter Gröveldalsvägen, 16.7. 1933. — Storån, nära Klingforsen, 7.8. 1936. — Storsätern, Storfallet, 670 m, 5.8. 1936. — Järna, Rämyrbacka—Högbergets fäb., 26.7. 1936. — Snöån, 25.7. 1936. — Leksand, i en bäck, 26.6. 1912 (Cedergren 1926). — Djuraån, 13.8. 1933. — Lima, Valla, 27.7. 1936. — Ludvika, Marnäs, 8.6. 1934. — Mora, Bossån, 19.6. 1934. — Björnån, 19.6. 1934. — Norrbärke, Flatenberg, 22.9. 1935. — Lernbo, 8.6. 1934. — Ore, Dalfors, 31.7. 1938. — Fjäckan, 17.6. 34. — Lömån, 16.6. 1934. — Stridbäcken, 16.6. 1934. — Orsa, Bäcka, 17.6. 1934. — Enån, 8.7. 1937. — Tällingsån, 17.6. 1934. — Rättvik, Draggån vid Springkällan, 15.6. 1934. — St. Skedvi, Djupdalen, 27.6. 1936. — St. Tuna, Bäckelund, 26.12. 1934; 26.6. 1936; 3. 3. 1938. — Bäckelund—Matsknuts, 11.4. 1938. — Tägt 26.6. 1936. — Trörö, 26.6. 1936. — Sundborn, Logärdens utlopp, 12.7. 1936. Svärdsjö, Svartnäsån, 26.8. 1937. — Vällingbäck, 29.8. 1932. — Åg, 13.7. 1936. — Särna, bäcken från Bålsjön, 500 m, 3.8. 1936. — Fjätros, Österdalälven, 9.8. 1936. — Mörkret, Njupån, 3.8. 1936. — Njupåsen, 600 m, 2.8. 1936. — Ån från Rensjön, 720 m, 1.8. 1936. — Bäcken från Slättåtjärn, c. 650 m, 1.8. 1936. — Säter, Dalen, 10.6. 1934. — Söderbärke, Hemshyttan, 24.9. 1935. — Tunkarlsbo, 22.9. 1935. — Transtrand, Brunnbäcken, 28.7. 1936. — Fulunäs, Fuluälven, 6.7. 1938. — Fulunäs, Råbäcken, 6.7. 1938. — Köarån, 28.7. 1936. — Vika, Färnviken, 25.9. 1932. — Vänjan, Kräggån, 18.6. 1937. — Vanån, c. 275 m, 18.6. 1937. — Älvdalen, Hållstugan, Gryvelån, 10.8. 1936. — Lillån, 11.8. 1936. — Lövåsbäcken, 10.8. 1936.

Gästrikland: Hamrånge, Hagsta, 19.6. 1936. — Hille, Hillevik, 19.6. 1936. — Åbyggeby, 24.8. 1937. — Högbo, Överbyn, ån från Öjaren, 30.7. 1938. — Ovansjö, Backberg, 24.8. 1937. — Storvik, Vallbyggeån, 30.7. 1938. — Torsåker, bäcken

från Malmjärn, 14.7. 1936. — Prästhyttan, 30.7. 1938. — Särsta, 14.7. 1936. — Valbo, Nybro, 7.7. 1937. — Österfärnebo, Gysinge, Dalälven, 14.7. 1936. — Sixbo, 14.7. 1936.

Hälsingland: Arbrå, Koldemo, 17.8. 1938. — Bollnäs, Röste, 17.8. 1938. — Bäcken från Yxsjön, 27.8. 1937. — Delsbo, Källbergsbo, 16.8. 1938. — Långede, 16.8. 1938. — Enånger, nära kyrkan, 20.6. 1936. — Ö. Bälan, 20.6. 1936. — Färila, Skyte, 29.8. 1937. — Svedja, 29.8. 1937. — Hanebo, Sixbo, 22.6. 1936. — Järvsö, Boda, 17.8. 1938. — Milån, 17.8. 1938. — Mo, Florsbacka, 27.8. 1937. — Norrala, Nårby, 20.6. 1936. — Njutånger, Njöte, 20.6. 1936. Ovanåker, bergbäck S Bursjömyren, 31.7. 1938. — Ljustjärnsbäcken, 31.7. 1938. — Våsån, 31.7. 1938. — Älmån, 27.8. 1937. — Skogsbo, Långbo, 22.6. 1936. — Söderala, n. Tönshammar, 20.6. 1936. — Undersvik, Simeå, 21.6. 1936. — Voxna, bäcken från Brynässjöarna, 31.7. 1932. — Överhogdal, Kvarnen, 2.8. 1938.

Härjedalen: Hede, bäck V Nysätern, 680 m, 15.8. 1938. — Vitåsen, 15.8. 1938. Bäck 4 km SO Särvsjö, 15.8. 1938. — Lillhärdal, Lillblekan, 520 m, 31.8. 1937. - Risbrunn—Härjåbron, 31.8. 1937. — Snössvallen, Härjån, 565 m, 31.8. 1937. — Slyn, 31.8. 1937. — Linsäll, Broforsen, 1.9. 1937. — Dalsvallen, 1.9. 1937. — Fjäten, c. 700 m, 8.8. 1936. — N. Strån, c. 625 m, 2.9. 1937. — Sveduberget, Fjällbäcken, 1.9. 1937. — Volmen, 1.9. 1937. — Storsjö, Helags, jökelbäcken, c. 1200 m, 6.9. 1937. — Nedom Predikstolen, c. 1020 m, 7.9. 1937. — Ljungdalen, bäcken från Viksjön, 650—700 m, 4.8. 1938. — Tännäs, Anån, c. 820 m, 4.8. 1938. — Funna, 580 m, 3.9. 1937. — Vemdalen, Norrveman, 14.8. 1938. — Skalsfjället, c. 700 m, 14.8. 1938.

Jämtland: Berg, Svensta, 2.8. 1938. — Utomsjön, 3.8. 1938. — Håsjö, Singsån nedom Lillsjön, 12.8. 1938. — Hällesjö, bäcken från Bjusjön, 12.8. 1938. — Gransjöån, 12.8. 1938. — Nära Kälarna, 13.8. 1938. — Klövsjö, Nybo, biflöde till Fiskån, 3.8. 1938. — Sångbäcken, 600—650 m, 14.8. 1938. — Ragunda, Hammarforsen, 11.8. 1938. — Singsån, 11.8. 1938. — Rätan, bäck från Galberget, 2.8. 1938. — Kvarnsjöbäcken, 2.8. 1938. — Röjan, 2.8. 1938. — Undersåker, bäck från Vålåsjöfjället, c. 1010 m, 9.8. 1938. — Ö. Ekorrån, c. 970 m, 6.8. 1938.

Ångermanland: Säbrå, Gådeå, 11.3. 1939. — Viksjö, Västanå, 14.5. 1939.

Norrbotten: Edefors, Nedre Svartlå, b. fr. Degermyren, 14.8. 1940. — Övre Svartlå, Flarkån, 15.8. 1940. — Bäck vid Mårdberget, 15.8. 1940. — Hietaniemi, Kuotojärvi, Pennikajoki, 26.7. 1940. — Karl Gustav, Långbacken, Sangisälven, 26.7. 1940. — Korpilombolo, n. Suaningi, Suaningijoki, 29.7. 1940. — N. Teurajärvi, Finnijoki, 29.7. 1940. — Nederkalix, Kamlungeforsen, 21.7. 1940. — Nederluleå, Råneå—Börjelslandet, Norrmarkbäcken, 21.7. 1940. — Nedertorneå, Aavajoki, 23.7. 1940. — Kukkolankoskis översta del, 25.7. 1940. — Pajala, Liviöjoki, 31.7. 1940. — Köngäsenkoski, 31.7. 1940. — Jalokoski, 1.8. 1940. — Ylinen Kihlangijoki, 1.8. 1940. — Kitkiöjärvi, Kitkiöjoki, 2.8. 1940. — Merasjärvi, Merasjoki, 2.8. 1940. — Råneå, Råneälven, 21.7. 1940. — B. fr. Dynträsket, 21.7. 1940.

Lule Lappmark: Jokkmokk, Laitätno vid utl. ur Laitaure, 23.8. 1940. — Sarek, Kåtokjokk-kåtan, b. fr. Vaikantjåkko, 27.8. 1940. — Sarek, Vaikanjokk, 27.8. 1940. — Pårekobservatoriet, Kaskakårsås V gren, 31.8. 1940.

Torne Lappmark: Jukkasjärvi, Lapporten, Tjuonajokk ovan Tjuonajaure, 10.8. 1940. — Karesuando, Kelojoki, 3.8. 1940. — Idijoki, 4.8. 1940. — Lustojoki, 4.8. 1940. — Alasjoki, 4.8. 1940. — Vittangi, b. fr. Ounistunturi, 5.8. 1940.

Hildenbrandia rivularis

Skåne: Balkåkra, Svarte, 22.7. 1935. — Billinge, Stockamöllan, 3.8. 1935. — Bläntarp—Everlöv, gränsbäcken, 22.7. 1935; 13.6. 1941. — Brönnestad, Råbockamöllan, 7.7. 1941. — Degeberga, Forsakar, 12.6. 1941. — Genarp, Häckeberga, 4.8. 1935. — Genarp—Gödelöv, Höje å, 4.8. 1935. — Grevie, bäck vid Bjärröd, 1936, DR (UV). — Gudmundtorp, Rolsberga, 28.7. 1935. — Hardeberga, Fågelsång, 25.7. 1935. — Harlösa, vid en mölla, 11.8. 1935. — Bäcken som bildar gräns mot Täpperyd, 11.8. 1935. — Hörby, Osbyholm, 28.7. 1935. — Ivetofta, Nymölla, 11.6. 1941. — Järrestad, Tommarpsån, 12.6. 1941. — Kävlinge, på stenar på åbotten under gamla landsvägsbrons valv, 3.7. 1897, H. G. Simmons (WNL 1601). — Köpinge, Köpingsmöllan, Tollarpsån, .7. 1941, Lh (U). — Maglehem, Julebodaån, 12.6. 1941. — Mölleberga, L. Mölleberga, 13.6. 1941. — N. Mellby, Sandåkra, 7.7. 1941. — Ramsåsa, Tryde å (Cedergren 1938); 22.7. 1935. — Rörum, nära Ströntemölla, 11.8. 1935. — Stiby, Tommarpsån, 11.8. 1935. — Vitaby, Vitemölla, 12.6. 1941. — Vollsjö, nära järnvägsstationen, 11.8. 1935. — V. Hoby, Krutmöllan, Kävlingeån, 14.6. 1941. — V. Karup, Småryd, bäck, 1936, DR (UV), ej karterad. — Bäck mellan Båstad och Norrviken, 1936, DR (UV), ej karterad. — Norrviken nära Båstad, G. E. Du Rietz (UV). — V. Vram, Tollarp, Vramsån vid färgeriet, 11.7. 1941, Lh (U). — Öved, Fiskarehus, 11.8. 1935. — Övedskloster, 11.8. 1935.

Blekinge: Sölvesborg, Sissebäck, 11.6. 1941.

Kalmar län: V. Ed, Edsbruk, i ån, 13.8. 1941, Lh (U).

[**Småland:** Mulseryd, Björnbäcken, på sönderslagen butelj (Cedergren 1938). Bekräftelse erfordras, då uppgiften synes stå i strid med vad som i övrigt är bekant om artens förekomst.]

Västergötland: Valtorp, Slafsan, 11.7. 1941.

Östergötland: Ekeby, Boxholm, Svartån, 2.7. 1941. — Heda, Disevid, 2.7. 1941. — Ledeberg, Odensfors, .6. 1940, S. Junell (U); 1.7. 1941. — Svanhals, L. Kullen, 2.7. 1941. — Styrestad, Ljura, 30.6. 1941. — Vist, Hovetorp, 1.7. 1941. — V. Husby, ån från Asplången, 30.6. 1941. — V. Tollstad, Vätterns strand S Ålebäck (Stålberg 1939). — Ödeshög, Vättern på c. 28 m. djup 5 km WNW Stava, 4. 1939 (Stålberg 1939).

Närke: Hovsta, Tjuse, Lillån, 23.6. 1938.

Södermanland: Bogsta, bukt av Runnviken c. 800 m Ö Nörby, 18.8.1941, Lh (U). — Husbyrekane, Rosenfors, 11.9. 1938. — Härad, Eksågen, 11.9. 1938. — Nyköping, Karlfors kvarn, 18.8. 1941, Lh (U); 6.9. 1941. — Sköldinge, Varbro kvarn, 9.9. 1941. — Södertörns villastad, Magelungen, 1937 (Waern 1938). — Trosa, Trosakvarn, 19.8. 1941, Lh (U). — Vagnhärad, Husby kvarn, 5.9. 1941. — Ytterjärna, Brogärde, 5.9. 1941. — Ösmo, Hammersta, i ån mitt för avtagsvägen till Segersäng, 1.8. 1941, Lh (U). — Ö. Vingåker, Genne elverk, 9.9. 1941.

Uppland: Almunge(?), Kärven, 1938 Lh (U). — Skärsjön, 30.5. 1941. — Alsike, Fläskjan, 1934 (Waern 1938). — Fredrikslund, Morgagrund, 1934 (Waern 1938). — Bondkyrka, Kvarnbo (V. B. Wittrock i »Kollegium om Sveriges sötvattensalger 1869» enl. Cedergren 1938 b). — Bromma, Nockeby, 1937 (Waern 1938). — Bälinge, Målsta, 20.5. 1937. — Sundbro, 1.6. 1936; 28.10. 1936. — Börje, Broby, 4.7. 1936. — Jumkil, Vallhov, 6.6. 1935. — Järfälla, Lövholmen, 1937 (Waern 1938). — Järlåsa, Strandsjön, klippö i Sunnansjöviken, 4.8. 1940, DR (UV). — Knivsta, Noor, 8.6. 1935. — Valloxen, 1914, R. Sernander (UV). — Lovö,

Kungshatt, 1937 (Waern 1938). — Länna, Bergshamra, 30.9. 1934. — Penningby, 30.9. 1934. — Nysätra, Alsta, 15.6. 1937. — Roslagskulla, vid kyrkan, 30.9. 1934. — Lo, 30.9. 1934. — Lunda, 12.6. 1936; 13.6. 1937. — Skokloster, Arnöhuvud, 1935 (Waern 1938). — Stavby, Skeberga, 14.6. 1936. — Söderbykarl, Rönsbol, 23.9. 1934; 2.10. 1934. — Tegelsmora, Tobo, 16.6. 1936. — Tierp, Gryttjom, 6.7. 1937. — Tolfta, Strömsberg, 7.9. 1941, Lh (U). — Torstuna, Kungshusby, 15.6. 1934. — Ununge, Skede, 1.10. 1934. — Vittinge, Ramsjön, 1939 Lh (U). — Västland, Karlholm, 7.9. 1941, Lh (U). — Västlands kvarn, 23.8. 1937; 7.9. 1941, Lh (U). — Lugnet, Tämnarån, 7.9. 1941, Lh (U). — V. Ryd, Mälarstranden, 1937, M. Waern (Waern 1938). — Yttergran, Lilla Ullevifjärden, 1934 (Waern 1938).

Västmanland: Köping, Tunafors, Kölstaån, 23.6. 1938.

Lemanea condensata

Värmland: Östmark, Nedre Röna, Rönaån, 26.6. 1938. — Östmark, Vallen, b. fr. Arnsjön, 26.6. 1940.

Härjedalen: Hede, bergbäck vid Vitåsen, c 450 m, 15.8. 1938. — Bäck 4 km SO Särvsjö, c. 625 m, 15.8. 1938. — Storsjö, Helags, glaciärbäcken, 1035 m, 5.8. 1938. — 1200 m, 6.9. 1937. — Bäck nedom Predikstolen, c. 1020, 7.9. 1937. — Ljungdalen, bäcken från Viksjön, 650—700 m, 4.8. 1938. — Tännäs, Storvallen, c. 705 m, 4.8. 1938.

Jämtland: Hällesjö, bäcken från Bjusjön, 12.8. 1938. — Undersåker, bäcken vid Nya Sylstationen, c. 1060 m, 7.8. 1938. — Gamla Sylstationen, c. 940 m, 7.8. 1938. — Bäck från V. Helagsskaftet, 900 m, 6.8. 1938. — Bäcken från Storsylglaciären, c. 1100 m, 7.8. 1938. — Bäck nära Vålåstugan, 9.8. 1938. — Ö. Ekorrån, 1090 m, 6.8. 1938.

Norrbotten: Nederkalix, Kamlungeforsen, 21.7. 1940. — Pajala, Köngäsenkoski, 31.7. 1940.

Lule Lappmark: Jokkmokk, Sarek, Laitätno vid utloppet ur Laitaure, 23. 8. 1940. — Rapaälven mitt för Puontavaratj, 26.8. 1940. — Säkokgrenen av Matirjokk, 30.8. 1940. — Kalakjokks utlopp i Pårekjaure, 31.8. 1940. — Vaikanjokk, c. 750 m, 27.8. 1940. — Pårekobservatoriet, Kaskakårsås V gren, 31.8. 1940.

Torne Lappmark: Jukkasjärvi, Abisko, bäck N Nuoljabäcken, c. 400 m, 8.8. 1940. — Bäck mellan Nissonjokk och Pallemjokk, 9.7. 1937, G. Sandberg (U). — Ortojokk, på kalkklippor, 23.8. 1909, B (B, L). — Lapporten, Tjuonajokk ovan Tjuonajaure, c. 1000 m, 10.8. 1940. — Bäck på Nissontjårros N sluttning. — Karesuando, Pahtakoski, 4.8. 1940.

Lemanea fluviatilis

Skåne: Andrarum, Forsemölla, 11.8. 1935. — Bläntarp-Everlöv, gränsbäcken, 13.6. 1941. — Brönnestad, Råbockamöllan, 7.7. 1941. — Brösarp, Värkeån, 11.8. 1935. — Degeberga, Forsakar, 12.6. 1941. — Frenninge, 6.7. 1899, O. J. Hasslow (B, G, L, U). — Fulltofta, Ljungstorp—Ludvigsborg, 28.7. 1935. — Ludvigsborg—Ramstorp, 28.7. 1935. — Färingtofta, Rägnaröd, bäcken efter vägen till Djupedal, 7.7. 1941. — Färlöv, Torsebro, 11.6. 1941. — Genarp—Gödelöv, Höjeån, 4.8. 1935. — Gråmanstorp, Klippan, 8.7. 1941. — Gudmundtorp, Rolsberga, 28.7. 1935. — Hardeberga, Fågelsång, 2.6. 1849, J. E. Zetterstedt (U); .5. 1875, B. Jönsson (L, U). — Harlösa, 23.5. 1882, O. Nordstedt (L). —

Möllan vid »258», 11.8. 1935 — Hjärnarp, nära Simonstorp, landskapsgränsbäcken, 8.7. 1941. — Stendal, 8.7. 1941. — Hästveda, i bäcken, 10.6. 1894, Hj. Möller, H. G. Simmons (B, I, L, S, U); 11.5. 1915, O. J. Hasslow (B, G, I, UV). — Höör, 26.4. 1896, K. Hirn, O. R. Holmberg (B, L). — Kärrarp, 3.8. 1935. — Sätofta, 28.7. 1935; 3.8. 1935. — Åkersberg, 3.8. 1935. — Hörby, Osbyholm, 28.7. 1935. — Hörja, S Hågnarp, Rökeån, 7.7. 1941. — Ivetofta, Nymölla, Skräbeån, 11.6. 1941. — Järrestad, Tommarpsån, 12.6. 1941. — Kviinge, Västerslöv, Almaån, 22.7. 1905, O. J. Hasslow (B). — Kävlinge, 9. 1864, J. E. Areschoug (L, R); 4. 1896 (Simmons 1898). — Lövestad, 12.6. 1906, O. J. Hasslow (B, G, U, UV). — Maglehem, Julebodaån, 12.6. 1941. — Munka-Ljungby, Hillarp, Rössjöholmsån, 8.7. 1941. — N. Mellby, Sandåkra, 7.7. 1941. — N. Sandby, Laxbromölla, 7.7. 1941, Lh (U). — Ramsåsa, 16.6. 1924 (Cedergren 1938 b). — Riseberga, V. Forestad, Rönneån, 9.7. 1941, Lh (U). — Skäralid, 24.5. 1899, N (G, L). — Rörum, nära Ströntemölla, 11.8. 1935. — Stehag, Bollamöllan, 27.5. 1937, C. Stenholm (G). — Stiby, Tommarpsån, 11.8. 1935. — St. Köpinge, Svenstorpsmölla, 12.6. 1941. — Veberöd, Hasslamöllan, 22.7. 1935. — Vollsjö, nära järnvägsstationen, 11.8. 1935. — V. Hoby, Krutmöllan, Kävlingeån, 14.6. 1941. — Öved, Övedskloster, 11.8. 1935.

Blekinge: Listerby, Listerbyån, 10.6. 1941. — Lyckeby(?), Lyckebyån, P. T. Cleve (U); 10.6. 1941. — Mörrum, Mörrumsån, 10.6. 1941. — Nättraby(?), Nättrabyån, C. Aspegren 1821(?) (L, S). — Ronneby, nära Gärestad, 10.6. 1941. — Lösen, Silletorpsån, C. Aspegren (L, S).

Kalmar län: Hossmo, Binga, Ljungbyån, 9.6. 1941. — Mönsterås, Mölsta, 6.6. 1941. — Nära Stubbemåla, Olmebäcken, 6.6. 1941.

Småland: Annerstad, Skeen, Bolmån, 6.7. 1941. — Aringsås, L. Änganäs, 18.7. 1935. — Bankeryd, Sjöåkra, 10.6. 1931, S. Suneson (L). — Berg, Hjulatorp, 4.7. 1941. — Hjälmseryd, Brohult, 4.7. 1941. — Hult, Hässelås damm, 30.6. 1889, R. Tolf (B). — Huskvarna, 1881, G. W. Montelin (L). — I ån ovan Huskvarna, 25.6. 1866, J. E. Zetterstedt (U). — Näsby, Hällinge, Ämån, 4.7. 1941. — Rogberga, 7.6. 1888, K. Johansson (B). — Ryssby, Långhult, 5.7. 1941. — Strättö, 5.7. 1941. — Slätthög, Hullevik—Bygget, 18.7. 1935. — Bäck Ö Strömhult, 18.7. 1935. — Urshult, 26.6. 1917, O. Borge (B, G, I, L). — Ö. Thorsås, Sunnansjö, 11.6. 1882, C. J. Johansson (B, G, L, S, U).

Halland: »Ex. herb. Swartzii» (S). — Kvibille, Suseån, 9.7. 1941. — Varberg, Göingegården, 3.6. 1928, D. E. Hylmö (L). — Kvarnagården, 29.4. 1928, D. E. Hylmö (L). — Träslöv, 20.5. 1928, D. E. Hylmö (L). — Vinberg, Tröinge, Ätran, 9.7. 1941. — Ås, Åsbro, Viskan, 10.6. 1925, B. Hylmö (L); 9.7. 1941. — ?, vid Högården, 5., S. Åkermark (Aresch. 278).

Göteborg: Backa(?), Lärje (S).

Bohuslän: Bäve, Groröd, 24.8. 1935. — Kuröd, 24.8. 1935. — Fors, Munkedal, .6. 1910, K (U). — Romelanda, i en bäck vid Bäcks gästgivargård, 12.7. 1876, N (S). — Uddevalla, 6. 1910, K (U). — I Risån, 6. 1884, T. O. B. N. Krok (S).

Dalsland: Dalskog, Hallarsbyn, 20.5. 1918, S. och C. Bergström (U). — L. Halängen, 25.8. 1935. — Gesäter, Rölandaån, 25.8. 1925. — Holm, Ingribyn, 19.6. 1866 etc. (WNL 104). — Högsäter, Tångelanda, 25.8. 1935. — Töftedal, Loviseholm, 24.8. 1935. — Ör, Åsmule, 25.8. 1935.

Västergötland: Ledsjö, Dala, Mariedalsån, 12.7. 1941. — Ljur, 10.7. 1909, K (U). — Kinna-Vedum, nära kyrkan, Svartån, 12.7. 1941. — Ornunga, .5. 1910 etc., K (U). — Sandhem, Svartån, 10.7. 1867, N (G, L, U). — Skarstad, Ruta kvarn, gnejshäll i Flian, 8. 1938, N. Albertson (U). — S. Ving, Bogakvarn,

Viskan, 10.7. 1941. — Ullervad, Trilleholm, Tidan, 12.7. 1941. — Våmb, Brandstorp, Våmbsbäcken, 12.7. 1941. — V. Gerum, Kilasändan, gnejshäll i Flian, 9. 1938, N. Albertson (U). — Åsaka, nedom dammen till Bergs kvarn, S. Berggren (L).

Östergötland: Ekeby, Boxholm, Svartån, 2.7. 1941. — Heda, Disevid, 2.7. 1941. — Landeryd, på kvarnrännan vid Slattefors, 1812, J. H. Wallman (S). — Ledeberg, Odensfors, Svartån, 1.7. 1941. — Linköping, Tinnerbäcken, 1.7. 1941. — Norrköping, Norrköpingsström, 1821 (S). — Skärkind, nära Bostorp, 30.6. 1941. — Svanhals, L. Kullen, 2.7. 1941. — Vist, Hovetorp, Stångån, 1.7. 1941.

Närke: Glanshammar, Tjugesta, 23.6. 1938. — Hovsta, Tjuse, 23.6. 1938. — Kvistbro, Svartå bruk, .6. 1885, K. Kjellmark (I). — Örebro, 5. 1869, F. R. Aulin (L).

Södermanland: Husbyrekane, Rosenfors, 11.9. 1938. — Härad, Eksågen, 11.9. 1938. — Kila, S. kyrkan, Virån, 6.9. 1941. — Nyköping, Karlsfors kvarn, Nyköpingsån, 18.8. 1941, G. Lohammar; 6.9. 1941. — Säterbo, Bäck, 17.7. 1896, O. Borge (B) ej karterad. — Taxinge, vid kyrkan, 12.9. 1938. — Trosa, Trosakvarn, Trosaån, 19.8. 1941, Lh (U). — Trosa-Vagnhärad, Husby, Trosaån, 5.9. 1941. — Västerhaninge, Fors, 23.5. 1937. — Åker, Berga, 11.9. 1938. — Ösmo, Ösmofors kvarn, 23.5. 1937; 1.8. 1941, Lh (U). — Ö. Vingåker, Genne, 9.9. 1941. — Överjärna, Saltåkvarn, 5.9. 1941.

Uppland: Alunda, Lunda, 14.6. 1936. — Bondkyrka, Kvarnbo, 20.5. 1858, J. E. Zetterstedt (U); 5. P.T. Cleve (U); 5. 1910, K (U); 9.6. 1924, J. A. Nannfeldt (B, I, L). — Lurbo (Cedergren 1913). — Bälinge, Målsta, 1.6. 1936. — Sundbro, 1.6. 1936. — Ulva, Areschoug (R); 6. 1860, T. O. B. N. Krok (S); 7.6. 1864, V. Wittrock (L, S, U); 18.5. 1913, C (G, U). — Börstil, Lesum, Olandsån, 15.6. 1936. — Härnevi, Vånsjöbro, 15.6. 1937. — Jumkil, Stenviken, 6.6. 1935. — Vallhov, 3.5. 1937. — Länna, Bergshamra, 30.9. 1934. — Väsby, 30.9. 1934. — Nysätra, Alsta, 15.6. 1937. — Rasbo, Vistebyån, 9. 1860, T. O. B. N. Krok (S). — Riala, Sättermossen, bäcken från Långsjön, 12.6. 1936. — Roslagskulla, Lo, 30.9. 1934. — Simtuna, Högby, 15.6. 1937. — Tierp, Gryttjom, Tämnarån, 6.7. 1937. — V. Ensta, 6.7. 1937. — Ununge, Skede kvarn, 1.10. 1934. — Uppsala, Fyris, (Aresch. 33, Åkerm. 16); G. Wahlenberg (U). — Vittinge, Grimle, 5.6. 1936. — Västland, Karlholm, 16.6. 1936. — Västlands kvarn, 23.8. 1937. — Åland, Ålandskvarn, 5.6. 1936. — Ärentuna, Rostad, 3.6. 1936.

Västmanland: Arboga, Arbogaån, 3.8. 1937. — Björskog, Stenvad, 23.6. 1938. — Östtuna, 23.6. 1937. — Ervalla, Dyltakvarn, 23.6. 1938. — Fellingsbro, Essingån, 3.8. 1937. — Grythyttan, Grythyttehed, 17.6. 1937. — Gunnilbo, Gisslarboån vid kyrkan, 16.6. 1937. — Stjärnvik, 16.6. 1937. — Järnboås, Rastälven nära Pettersfors, 2.8. 1937. — Köping, Jämnestunabäcken, 25.7. 1843, Ex. herb. H. von Post (S). — Tunafors, Kölstaån, 23.6. 1938. — Ramnäs, Kolbäcksån, Bruket, 16.6. 1937. — Sevalla, Väsby, 15.6. 1937. — Skultuna, Forsby, Svartån, 16.6. 1937.

Värmland: Brattfors, Svartå, 17.10. 1938. — Fryksände, Torsby, bäcken från Vassjön, 26.6. 1938. — Åshagen, 25.6. 1938. — Glava, Hb. Düben (L). — Kristinehamn, 7. 1867, N. G. W. Lagerstedt (S). — Kroppa, Gammalkroppa (S). — Lungsund, Lungsälven, c. 112 m, 17.10. 1938. — Nyed, Lindfors, 7. 1910, K (U). — Norums bruk, i älven, 24.6. 1899, A. Hülphers (B, L). — Varnum(?), Lötälven nära Östramosse, 1886, C. M. Broström (G, U). — V. Ämtervik, ån från Aplungen, 25.6. 1938. — Väse, vid kyrkan, 24.6. 1938. — Älvsbacka, Östanås,

17.10. 1938. — Östmark, Nedre Röna, Rönaån, 26.6. 1938. — Vallen, bäcken från Arnsjön, 26.6. 1938.

Dalarna: By, Hede kvarn, 7.7. 1936. — Garpenberg, Dormsjö, ån från Dormen, 27.6. 1936. — Grytnäs, Hyttan, 4.9. 1932; 28.6. 1936. — Husby, Rörshyttan, 7.7. 1936. — Idre, Storsätern, Grövelån, c. 670 m, 5.8. 1936. — Storån efter Foskrosvägen, 7.8. 1936. — Storån vid bron efter Gröveldalsvägen, 16.7. 1933. — Mora, Björnån, 19.6. 1934. — Bossån, 19.6. 1934. — Norrbärke, Lernbo, 8.6. 1934. — Ore, Östanvik, Lömån, 16.6. 1934. — Arvet, Fjäckan, 17.6. 1934. — Sunnanhed, Stridbäcken, 16.6. 1934. — Orsa, Bäcka, 17.6. 1934. — Enån, mellan sågen och kvarnen, 14.6. 1925, N. E. Svedelius (U); Höglunda, 25.8. 1933; 18.6. 1934; 8.7. 1937. — Hansjö, Unnån, 17.6. 1934. — Tällingsån efter Ore-vägen, 17.6. 1934. — Ämådalen, Ämån, 18.6. 1934. — Rättvik, Draggån, c. 208 m, 15.6. 1934. — St. Tuna, Bäckelund, 26.12. 1934. — Trönö, 26.6. 1936. — Täkt, 26.6. 1936. — Svärdsjö, Kvarntäkt, 7.8. 1932. — Särna, Mörkret, Njupån, 3.8. 1936. — Säter, Dalen, 10. 6. 1934. — Söderbärke, Hemshyttan, 24.9. 1935. — Tunkarlsbo, 22.9. 1935. — Viksberg, 22.9. 1935. — Transtrand, Fulunäs, Fuluälven, 6.7. 1938. — Råbäcken, 6.7. 1938. — Brunnbäcken, 28.7. 1936. — Våmhus, Ö. Storbyn, 17.6. 1934. — Vånjan, Kräggån, 18.6. 1937. — Älvdalen, Evertsbergsvägen, Lillån, 11.8. 1936. — Hållstugan, Gryvelån, 10.8. 1936. — Oxberg, Österdalälven, 15.7. 1933.

Gästrikland: Hamrånge, Hagsta, 19.6. 1936. — Hille, Hillevik, 19.6. 1936. — Åsbyggeby, 24.8. 1937. — Hedesunda, Ölbo, 30.7. 1938. — Torsåker, Prästhyttan, 30.7. 1938. — Särsta, 14.7. 1936. — Valbo, Nybro, 7.7. 1937. — Österfärnebo, Gysinge, 14.7. 1936.

Hälsingland: Bollnäs, Röste, 17.8. 1938. — Enånger, Kyrkbyn, 20.6. 1936. — Ö. Bälan, 20.6. 1936. — Färila, Svedja, 29.8. 1937. — Järvsö, Löräng, Milsån, 17.8. 1938. — Teveån, 21.6. 1936. — Lingbo, Västeräng, 22.6. 1936. — Ljusdal, 7. 1909, H. Kylin (U). — Norrala, Nårby, 20.6. 1936. — Ovanåker, bergbäck S Bursjömyren, 31.7. 1938. — Ljustjärnsbäcken, 31.7. 1938. — Våsån, 31.7. 1938. — Skogsbo, Långbo, 22.6. 1936. — Söderhamn, 20.6. 1936. — Undersvik, Simeå, 21.6. 1936. — Överhogdal, Kvarnen, 2.8. 1938.

Härjedalen: Hede, Långån, Ljusnan (Cedergren 1932). — Linsäll, Broforsen, Ljusnan, 1.9. 1937. — N. Strån, 2.9. 1937. — Valmen, 1.9. 1937. — Vemdalen (Cedergren 1932). — Norrveman, 14.8. 1938.

Jämtland: Berg, Börtnan, Arån, 3.8. 1938. — Svensta, 2.8. 1938. — Utomsjön, Galån, 3.8. 1938. — Ragunda, Singsån, 11.8. 1938. — Rätan, Röjan, 2.8. 1938.

Ångermanland: Säbrå, Gådeå, 5.3. 1939; 11.3. 1939. — Viksjö, Västanå, 14.5. 1939.

Västerbotten: Lövånger, på dammbordet i Avafjärdens utlopp, 4.7. 1897, B (B).

Norrbotten: Edefors, Nedre Svartlå, 14.8. 1940. — Övre Svartlå, Flarkån, 15.8. 1940. — Bäck vid Mårdberget, 15.8. 1940. — Hietaniemi, Pennikajoki, 26.7. 1940. — Karl Gustav, Långbacken, 26.7. 1940. — Korpilombolo, Finnijoki nära Teurajärvi, 29.7. 1940. — Suaningijoki nära Suaningi, 29.7. 1940. — Nederluleå, Avan, bäcken från Bälingsträsket, 20.7. 1940. — Råneå-Börjelslandet, Norrmarkbäcken, 21.7. 1940. — Nedertorneå, Aavajoki, 23.7. 1940. — Kukkolankoski, nära flottningsstugan samt vid forshuvudet, 25.7. 1940. — Råneå, Råneälven, 21.7. 1940. — Övertorneå, ån från Kuitasjärvi, 27.7. 1940.

Torne Lappmark: Jukkasjärvi, Kuosanen—Altajärvi, Siikajoki, 6.8. 1940. — Karesuando, V grenen av Ainettijoki, 4.8. 1940. — Lustojoki, 4.8. 1940. — Kallakojoki, 4.8. 1940. — Vittangi, Kulijoki, 5.8. 1940.

Pseudochantransia chalybaea

Skåne: Brönnestad, Råbockamöllan, 7.7. 1941. — Fulltofta, Ludvigstorp—Ramstorp, 28.7. 1935. — Genarp—Gödelöv, Höje å, 4.8. 1935. — Höör, Kärrarp, 3.8. 1935. — Sätofta, 28.7, 3.8. 1935. — Hörja, Rökcån nära kyrkan, 7.7. 1941. — Ivetofta, Nymöllan, 11.6. 1941. — Munkarp, Hålsaxbäcken, 3.8. 1935. — Ramsåsa, 16.6. 1924 (Cedergren 1938). — Veberöd, Hasslamöllan, 22.7. 1935. — V. Hoby, Krutmöllan, 14.6. 1941. — V. Sönnarslöv, Hör, 8.7. 1941.

Blekinge: (Borge 1930). — Listerby, Listerbyån, 10.6. 1941. — Lösen Ö kyrkan, 10.6. 1941.

Gotland: Lummelunda, Överstekvarn, 24.5. 1937.

Kalmar län: Hagby, Hagbytorp, i ån vid landsvägsbron, 15.7. 1941, Lh (U). — Hossmo, Binga, Ljungbyån, 9.6. 1941. — Ljungby, Kölby kvarn, 15.7. 1941, Lh (U). — Mönsterås, Mölsta, 6.6. 1941. — Ryssby, i ån vid landsvägsbron S kyrkan, 16.7. 1941, Lh (U). — Söderåkra, Bruatorp, 9.6. 1941.

Småland: Bellö, Bolstra, 3.7. 1941. — Ryssby, Strättö, 5.7. 1941.

Halland: Tvååker, Björkäng, 9.7. 1941. — Ås, Åsbro, Viskan, 9.7. 1941.

Göteborg: J. E. Areschoug (U).

Bohuslän: Bäve, Groröd, 24.8. 1935. — Kuröd, 24.8. 1935.

Dalsland: Dalskog, L. Halängen, 25.8. 1935. — Järbo, St. Bön, Valboån, 25. 8. 1935.

Västergötland: Kinna-Vedum, Svartån nära kyrkan, 12.7. 1941. — Ledsjö, Dala, Mariedalsån, 12.7. 1941. — Marum, Flian nedom kyrkan, 12.7. 1941.

Östergötland: Konungsund, Vadsbäcken, 30.6. 1941. — Skärkind, nära Bostorp, 30.6. 1941. — Styrestad, Ljura, 30.6. 1941.

Närke: (Borge 1930). Glanshammar, Tjugesta, 23.6. 1938. — Gällersta, Almbro, 8.9. 1941. — Götlunda, Sickelsjö, 23.6. 1938. — Hidinge, Villingsberg, 24.6. 1938. — Hovsta, Tjuse, Lillån, 23.6. 1938. — Kvistbro, Backa, 8.9. 1941. — Torpa, N. Forsuma, 11.9. 1938.

Södermanland: Barva, nära Nabbtorp, 11.9. 1938. — Brännkyrka, L. Sikla, 23.6. 1935. — Husbyrekane, Rosenfors, 11.9. 1938. — Hyltinge, Sparreholm, bäcken från Högsjön, 9.9. 1941. — Härad, Eksågen, 11.9. 1938. — Kila, Horsbråten, 6.9. 1941. — Stavsjökvarn, 6.9. 1941. — Virån S kyrkan, 6.9. 1941. — L. Mellösa, Stocktorps kvarn, 9.9. 1941. — Lästringe, Tuvekvarn, 5.9. 1941. — Nacka, 6. 1863, P. T. Cleve (S). — Nyköping, Karlfors kvarn, 18.8. 1941, Lh (U); 6.9. 1941. — Salem, Högantorp, 12.9. 1938. — Sköldinge, Varbro, 9.9. 1941. — Sorunda, Källsta kvarn, 26.5. 1937; 3.8. 1941, Lh (U). — Svärta, Svärta gård, 18.8. 1941, Lh (U); 5.9. 1941. — Taxinge, vid kyrkan, 12.9. 1938. — Toresund, Kvarntorp, 11.9. 1938. — Trosa, Trosakvarn, 19.8. 1941, Lh (U). — Trosa-Vagnhärad, Husby kvarn, 19.8. 1941, Lh (U); 5.9. 1941. — Tunaberg, Nävekvarn, 17.8. 1941, Lh (U). — Turinge, Sundsvik, 12.9. 1941. — Västerhaninge, Fors, 23.5. 1937. — Ytterjärna, Brogärde, 5.9. 1941. — Åker, Björnnäs, 12.9. 1938. — Ösmo, N. Fors, 23.5. 1937. — Ö. Vingåker, Genne elverk, 9.9. 1941. — Överjärna, Saltå, 5.9. 1941.

Uppland: Almunge, Torslunda, 29.9. 1934. — Alunda, Lunda, 14.6. 1936. — Bladåker, Vällnora, 30.5. 1937. — Bondkyrka, Kvarnbo, 20.5. 1852 (S); 9. 1863, P. T. Cleve (S, U). — Lurbo, 7. 1857 (S). — Bälinge, Sundbro, 1.6. 1936, 28.10. 1936. — Nära kyrkan, 9.9. 1934. — Målsta kvarn, 1.6. 1936, 20.5. 1937. — Ulva kvarn, 7.6. 1864, etc., V. Wittrock (S, U); 1871, W. Berndes (U); 9.9. 1934, 8.11.

1938. — Börje, Broby, 4.7. 1936. — Börstil, Ledum, Olandsån, 15.6. 1936. — Film, Österby, 16.6. 1936. — Forsmark, Berkinge, 15.6. 1936. — Fresta, Fornboda, 23. 5. 1937. — Frösunda, ån nära Fågelsunda, 29.6. 1937. — Harg, vid smedjan, 15. 6. 1936. — Husbylånghundra, Åby kvarn, 11.6. 1936. — Husbyärlinghundra, Märsta, 20.5. 1937. — Härnevi, Vånsjöbro, 15.6. 1937. — Hökhuvud, Veddicka, 14.6. 1936. — Jumkil, Vallhov, 3.5. 1937; 12.6. 1937. — Stenviken, 6.6. 1935. — Järlåsa, Bredsjöbäcken, 5.6. 1936. — Knivsta, Forsby, 8.6. 1935. — Kvarntorp, 8.6. 1935. — Knutby, Åsby, 18.5. 1937. — Kårsta, Backa, 29.6. 1937. — Litslena, Skolsta, 23.6. 1938. — Lohärad, Kristineholm, 1.9. 1934. — Vid kartans kvarn, 2.10. 1934. — Länna, Bergshamra, 30.9. 1934, 12.6. 1936. — Penningby, 30.9. 1934. — Nora, Åby, 24.10. 1937. — Norrby, Varmsätra, 2.6. 1937. — Nysätra, Alsta, 15.6. 1937. — Orkesta, Hästberga, 29.6. 1937. — Riala, Sättermossen, 12 6. 1936. — Nära kyrkan, 30.9. 1934. — Rimbo, Alhamra, bäcken från Metsjön, 11.6. 1936. — Roslagsbro, Bredsätra, bäcken från sjön »67», 23.9. 1934. — Roslagskulla, Lo, 30.9. 1934. — Rö, Beateberg, bäcken från Angarn, 12.6. 1936. — Simtuna, Högby, 15.6. 1937. — Skederid, Björkholmen, 22.9. 1934. — Finsta, 22.9. 1934. — Skepptuna, Törne, 29.6. 1937. — Örby, 29.6. 1937. — Skogstibble, Strandsjön, 1940, W (UV). — Skäfthammar, Gimo, 14.6. 1936. — Sollentuna, Landsnora, 26.5. 1937. — Söderbykarl, Broby, 1.10. 1934. — Risslingby kvarn, 1.10. 1934. — Tensta, Järsta, 23.8. 1937. — Tierp, Gryttjom, 6.7. 1937. — V. Ensta, 6.7. 1937. — Tolfta, N. Rocknö, 6.7. 1937. — Torstuna, Kungshusby, 15.6. 1937. — Täby, Hägernäs, 1.7. 1937. — Ununge, Skede, vid kartans kvarn, 1.10. 1934. — Uppsala, Fyris, 6. F. S. Areschoug (Aresch. 232); Islandsfallet, 6.7. 1878, V. Wittrock (WNL 304 p. p., p. p. *Chantransia Hermanni*). — Vittinge, Grimle, 5.6. 1936. — Väddö, Ortala, 13.6. 1937. — Västerlövsta, Molnebo, 5.6. 1936. — Västland, Karlholm, 16.6. 1936. — Västlands kvarn, 23.8. 1937. — Åkerby, Uggelstad, 28.10. 1936. — Åland, Ålandskvarn, 5.6. 1936. — Ärentuna, Rostad, 3.6. 1936. — Össebygarn, bäcken från Härsan, 12.6. 1936. — Ådra, 29.6. 1937. — Österlövsta, Lövsta bruk, 15.6. 1936. — Hilleboda, 16.6. 1936. — Östervåla, Åby, 24.10. 1936. — Österåker, Hacksta, 1.7. 1937. — Nykvarn, 1.7. 1937. — Ö. Ryd, Ullna kvarn, 1.7. 1937. — Östuna, Hällby, Storån, 22.9. 1934. — Risberga, 22.9. 1934.

Västmanland: Björskog, Stenvad, 23.6. 1938. — Östtuna, 23.6. 1938. — Fellingsbro, Finnåker, 18.10. 1938. — Gunnilbo, Gisslarboån, 16.6. 1937. — Bäck nära Stjärnvik, 16.6. 1937. — Köping, Tunafors, 23.6. 1938. — Ramnäs, Bruket, 16.6. 1937. — Sala, Josefsdal, 2.6. 1937. — Kvarnen, 2.6. 1937. — Sevalla, Väsby, 15.6. 1937. — Kinsta, 15.6. 1937. — Skultuna, Forsby, 16.6. 1937. — Bovallen, 16.6. 1937. — Säterbo, på mossa på stenar i gamla »Hjälmare kanal», 29.7. 1888, B (HR 738). — Västerfärnebo, bäcken från Gåsbarken, 24.7. 1936.

Värmland: (S). Bjurtjärn, Alkvettern, 18.10. 1938. — Brattfors, Svartå, 17.10. 1938. — Fryksände, Torsby, bäcken från Vassjön, 26.6. 1938. — Ashagen, 25.6. 1938. — Ransäter, Munkfors, bäcken vid tegelbruket, 30.6. 1938. — Sunne, Stopefors, 25.6. 1938. — Väse, Glumman, 24.6. 1938. — V. Ämtervik, ån från Aplungen, 25.6. 1938.

Dalarna: By, Hede kvarn, 7.7. 1936. — Folkärna, Utsund, 28.6. 1936. — Grytnäs, Hyttan, 4.9. 1932; 28.6. 1936. — Garphyttan, 24.12. 1934. — Hyttbäcken, 4.9. 1932. — Gustafs, Milsbo, 27.6. 1936. — Husby, Ansta—Djupdalen, 31.8. 1932. — Idre, bäck från ostsidan av Fjätervålen vid »629,0», 8.8. 1936. [Borge (1930) nämner flera lokaler från Grövelsjöområdet. På en av dem, Storfallet i Grö-

velån, har jag ej kunnat finna *Ps. chalybaea* men väl *Chantransia.*] — Långfjället, Foskån strax nedom södra Fosksjön, 7.8. 1925, c. 890 m. — Norrbärke, Flatenberg, 22.9. 1935. — St. Tuna, Bäckelund, 26.6. 1936. — Rågåker, 17.9. 1932; 30.6. 1933. — Trönö, 26.6. 1936. — Täkt, 26.6. 1936. — St. Skedvi, Djupdalen, 31.8. 1932. — Lövåsen, 31.8. 1932. — Ansta, 25.9. 1932. — Landsbro, 25.9. 1932. — Särna, Mörkret, Njupån, 3.8. 1936. — Njupåsen, Lilla Njupån, 2.8. 1936. — Säter, Dalen, 10.6. 1934. — Söderbärke, Hemshyttan, 24.9. 1935. — Viksberg, 22.9. 1935. — Vika, Färnviken, 25.9. 1932.

Gästrikland: Gävle, Kungsbäcken, 24.8. 1937. — Hedesunda, Ölbo, 30.7. 1938. — Hille, Hillevik, 19.6. 1936. — Högbo, Överbyn, ån från Öjaren, 30.7. 1938. — Ovansjö, Backberg, 24.8. 1937. — Storvik, Vallbyggeån, 30.7. 1938. — Torsåker, Prästhyttan, 30.7. 1938. — Särsta, 14.7. 1936.

Hälsingland: Arbrå, Koldemo, 17.8. 1938. — Delsbo, Långsbo, 16.8. 1938. — Färila, Svedja, 29.8. 1937. — Hanebo, Sixbo, 22.6. 1936. — Hudiksvall, bäcken vid N. utfarten, 16.8. 1938. — Järvsö, Boda, 17.8. 1938. — Mo, Florsbacka, 27.8. 1937. — Söderhamn, kvarnen, 20.6. 1936.

Härjedalen: Lillhärdal, Risbrunn—Härjåbron, 31.8. 1937. — Linsäll, Kölåsen, Fjäten, c. 700 m, 8.8. 1936.

Jämtland: Klövsjö, Risvallen, Röjan, 14.8. 1938.

Ångermanland: Säbrå, Järsta, 11.3. 1939. — Viksjö, Västanå, Eksjöån, 14. 5. 1939.

Norrbotten: Edefors, nära Forsnäs, 15.8. 1940. — Övre Svartlå, Flarkån, 15.8. 1940. — Nederluleå, Avan, 20.7. 1940. — Överluleå, Nedre Bredåker, 14.8. 1940.

Lule Lappmark: Jokkmokk, Boden-vägen, bäcken invid landskapsgränsen, 15.8. 1940.

Torne Lappmark: Karesuando, Idijoki, 4.8. 1940. — Kelojoki, 3.8. 1940.

Pseudochantransia chalybaea var. *profunda*

Östergötland: Ödeshög, Vättern på c. 28 m djup 5 km WNW Stava .4. 1939 (Stålberg 1939).

Pseudochantransia Leibleinii

Skåne: Mölleberga, L. Mölleberga, Segeån, 10.8. 1935; 13.6. 1941. — V. Hoby Krutmöllan, Kävlingeån, 14.6. 1941.

Pseudochantransia pygmaea

Skåne: Andrarum, Forsemölla, 11.8. 1935. — Balkåkra, Svarte, 22.7. 1935. — Bläntarp—Everlöv, 22.7. 1935. — Everlöv, Orehus, 22.7. 1935. — Fulltofta, Ludvigstorp—Ramstorp, 28.7. 1935. — Genarp—Gödelöv, Höjeån, 4.8. 1935. — Harlösa, vid möllan vid »258», 11.8. 1935. — Höör, Kärrarp, 3.8. 1935. — Järrestad, Tommarpsån, 12.6. 1941. — Rödinge, Kurremölla, 22.7. 1935. — Rörum, Ströntemölla, 11.8. 1935. — Veberöd, Hasselmöllan, 22.7. 1935. — Vollsjö, NV järnvägsstationen, 11.8. 1935. — Öved, Övedskloster, 11.8. 1935.

Blekinge: Sölvesborg, Sissebäck, 11.6. 1941.

Västergötland: Våmb, Brandstorp, vid en liten bro, 12.7. 1941. — V. Tunhem, Lindås, 26.8. 1935.

Östergötland: V. Husby, ån V kyrkan, 30.6. 1941.

Närke: Kvistbro, Backa, Svartån, 8.9. 1941. — Tysslinge, St. Valla, 24.6. 1938.

Södermanland: Hölö, Åby kvarn, 5.9. 1941. — Nacka, Nacka gård, 23.5. 1935.

Uppland: Alunda, Lunda, 14.6. 1936. — Rimbo, Alhamra, 11.6. 1936. — Roslagsbro, Lundakvarn, 12.6. 1936, 13.6. 1937. — Väddö, Gåsvik, 1.10. 1934. — Österlövsta, Hilleboda, Strömarån, 16.6. 1936.

Västmanland: Fellingsbro, Essingån, 3.8. 1937.

Värmland: Bjurtjärn, Alkvettern, 18.10. 1938. — Järnboås, nära Pettersfors, Rastälven, 2.8. 1937.

Dalarna: Boda, Styggforsen, 16.6. 1934. — V. Boda, bäck efter vägen till Styggforsen, 16.6. 1934. — Ludvika, Norrvik, 24.9. 1937. — Ore, Dalbyn, Andån, 16.6. 1934. — Orsa, Kallholn, bäcken från Åbergatjärn, 17.6. 1934. — Tällingsån, 17.6. 1934. — Rättvik, Nittsjö, Ammtjärnsbäcken vid tegelbruket, 16.6. 1934. — Nittsjö, bäcken från Nittsjön, 16.6. 1934. — V. Nittsjö, 16.6. 1934; 25.8. 1933. — Vikarbystrand, 16.6. 1934. — Enskvarn, 15.6. 1934. — Springkällan vid Draggån 15.6. 1934. — St. Skedvi, Långbro, bäcken från Lomsjön, 9.5. 1937. — Söderbärke, Hemshyttan, 24.9. 1937.

Hälsingland: Alfta, bäcken från Kyrktjärn, 27.8. 1937. — Forsa, Bäck, 16. 8. 1938. — Hudiksvall, vid N. utfarten, 16.8. 1938.

Härjedalen: Storsjö, Helags, bäck nedom Predikstolen, c. 900 m, 7.9. 1937. — Tännäs, Storvallen, 4.8. 1938.

Jämtland: Berg, Svensta, 2.8. 1938. — Frösö, Fillstabäcken, 14.8. 1938. — Hammerdal, Gisselås, 11.8. 1938. — Håsjö, Singsån nedom Lillsjön, 12.8. 1938. — Hällesjö, Gransjöån, 12.8. 1938. — Klövsjö, strax S Klövsjöbyn, 14.8. 1938. — Sångbäcken, 14.8. 1938. — Ragunda, Hammarforsen, 11.8. 1938. — Rödön, Hismofors, 10.7. 1909, K (U). — Sunne, nära kyrkan, 14.8. 1938. — Hära, 14.8. 1938.

Pseudochantransia serpens

Jämtland: Hällesjö, Ö. Våntjärn, 1937, T. Borgh; 13.8. 1938, T. Borgh och I (U).

Sirodotia suecica

Skåne: Osby, 3.8. 1909 (B, L, S, U). — Örkelljunga, Åsljunga, Jägersholm, 7.7. 1941.

Blekinge: C. Aspegren? (LA, S).

Kalmar län: Mönsterås, Ämsfors, Ämån, 6.6. 1941.

Småland: Alvestad, K (Kylin 1912). — Aneboda, bäcken från Förhultsjön, 18.7. 1935. — Bergunda, Bergsnäs, i forsen, 2.7. 1931, C (G, I, L). — Örsled, Helgeån, i forsen, 26.6. 1931, C (I, L). — Bottnaryd, nära Bäckanäs, Älgån, 10.7. 1941. — Hjortsberga, 5.8. 1909, K (L, S, U). — L. Forsdala, 18.7. 1935. — Ljungby, Lagan, 6.7. 1941. — Markaryd, Ågård, på stenar i Lagan, 4.7. 1936, E. Julin (UV). — Moheda, 5.8. 1909, K (L, S, U). — Ryssby, Långhult, 5.7. 1941. — Säby, Åsvalehult, 7.8. 1909, K (S, U). — Thorsås, Sunnansjö, 28.5. 1882 etc., C. J. Johansson (I, L, S, U). — Unnaryd, P. M. Lundell (R); (?) 7. (Aresch. 307).

Halland: Breared, Fylleån, strax nedom utloppet ur Brearedssjön alldeles ovan landsvägsbron, 7.7. 1937, DR (UV).

Göteborg: (T).

Bohuslän: Bäve, Groröd, 24.8. 1935.

Dalsland: Järbo, St. Bön, 25.6. 1935. — Töftedal, Loviseholm, 24.8. 1935. — Lundby, 3.8. 1876, N (WNL 1351 a).

Västergötland: Habo, Risbro, 11.7. 1941. — Utvängstorp, Tidan, 11.7. 1941.

Närke: Hidinge, Lekebergsån, 24.6. 1938. — Villingsberg, 24.6. 1938.

Uppland: Jumkil, Karlslund, bäcken från Fänsjöarna, 9.6. 1935. — Järlåsa, Östfora, 9.6. 1935. — Älvkarleby, Glamstorpen, 7.7. 1937. — Österåker, Ytterby, 1.7. 1937.

Västmanland: Björskog, Östtuna, 23.6. 1938 — Ervalla, Dyltakvarn, 23.6. 1938. — Norberg, Svartån, 23.8. 1932. — Gäsjö, 23.8. 1932. — Ramnäs, Bruket, 16.6. 1937. — Nybrobäcken, 16.6. 1937. — Ramsberg, Heden, 16.6. 1937. — Hägernäs, 16.6. 1937. — Rällså, 16.6. 1937. — Skultuna, Bovallen, 16.6. 1937. — Västerfärnebo, Rosshyttan, 24.7. 1936.

Värmland: Brattfors, Svartå, 17.10. 1938. — Ekshärad, bäcken från Acksjön, 2.8. 1937. — Götån, 30.6. 1938. — Vångån, 30.6. 1938. — Fryksände, Ljusnan nära Enäs, 25.6. 1938. — Torsby, Röjdån, 26.6. 1938. — Gustav Adolf, nära Lappmossåsen, bäcken från Lillsjön, 28.6. 1938. — Gåsborn, Kvarnen, 17.6. 1937. — N. Finnskoga, Husbäcken, 1.8. 1937; 30.6. 1938. — Tåsängen, 1.8. 1937. — Varån, 1.8. 1937. — Höljes, 30.6. 1938. — N. Ny, Femtan, 1.8. 1937. — Sågbacken, 30.6. 1938. — Värnäs, Värån, 30.6. 1938. — Nordmark, Finnmossen, Timsälven, 17.10. 1938. — Mokärrshyttan, 29.7. 1804, G. Wahlenberg etc. (LA, S, U). — Nyed, Lindfors, 27.7. 1910, K (S, U). — S. Finnskoga, Bjurberget, Mangslidsälven, 27.6. 1938. — Våtsjöån, 27.6. 1938. — Älgsjön, 27.6. 1938. — Sunne, Stopefors, 25.6. 1938. — Östmark, Röjdåfors, 26.6. 1938.

Dalarna: Avesta, Dalälven, 24.7. 1936. — Enviken, Björktjärnsbäcken, 7.8. 1932. — Lamborn, 26.6. 1934. — Bäcken från L. Mosan, 26.6. 1934. — Över Tänger, 26.6. 1934. — Floda, Håvån, 7.6. 1934. — Käringforsen, 25.7. 1936. — Gagnef, Österfors, 13.8. 1933. — Grangärde, Norrboån, 6.6. 1934. — Salån, 6.6. 1934. — Hedemora, Grådö, 10.7. 1933; 30.7. 1933. — Husby, Born, 7.7. 1936. — Idre, Häggsundet, Älvros, myrbäck, 16.7. 1933. — Storån, vid bron efter Gröveldalsvägen, 16.7. 1933. — Järna, Gruckåkvarn, 14.8. 1932. — Hulån, 14.8. 1932. — Snöåkvarn, 14.8. 1932; 25.7. 1936. — Lima, Siktån, 18.7. 1933. — Malung, Granåbron, 28.6. 38. — Järsbubäcken, 27.6. 1938. — Megrinnsbäcken, 15.8. 1932; 27.7. 1936. — Tevalen, 15.8. 1932. — Örartjärnsbäcken, 28.6. 1938. — Ore, Dalfors, 31.7. 1938. — Fjäckan, 17.6. 1934. — Näsfäb., bäcken från Nyckeltjärn, 1.8. 1938. — Östanvik, 7.7. 1910, K (U). — Orsa, Bäcka, 17.6. 1934. — Hansjö, Ore älv, 17.6. 1934. — Hevoslampibäcken, 1.8. 1938. — Skålbygge, 1.8. 1938. — Rättvik, Bingsjö, Loggasbäcken, 17.7. 1938. — Siljansnäs, Limån, 19.6. 1934. — Sollerö, Mångån, 19.6. 1934. — Ryssån, 19.6. 1934. — St. Tuna, Baggbo såg, 9.8. 1932. — Ån mellan Flokan och Tunsan, 9.8. 1932. — Hytting—Högberget, 9.8. 1932. — Stångtjärn, 8.8. 1932. — Täkt, 26.6. 1936; 14.2. 1941; 18.3. 1941. — Underberg, 17.9. 1932. — Svärdsjö, Svartnäs, Laxbäcken, 28.8. 1932. — Vinnerån, 29.8. 1932. — Säfsnäs, Annefors, bäcken från Älgsjön, 23.9. 1935. — Stenälven, 23.9. 1935. — Ulriksberg, 7.6. 1934; 22.9. 1935. — Särna, ån från Rensjön, c. 720 m, 1.8. 1936. — Våmhus, Våmån, 17.6. 1934. — Vänjan, Västbygge, 18.6. 1937. — Älvdalen, Evertsberg—Oxberg, 11.8. 1936. — Lillån, 11.8. 1936.

Gästrikland: Hamrånge, bäck mellan Fagervik och Katrineholm, 19.6. 1936. — Svartån, 20.6. 1936; 26.8. 1937. — Hille, Hillevik, 19.6. 1936. — Trödje, 19.6.

1936. — Ockelbo, 16.7. 1909, K (B, L, S, U). — Skogsbäck nära Grönviken, 22.6. 1936. — Hällbäcken, 29.8. 1932; 22.6. 1936. — Kvidsjöbäcken, 6.8. 1934. — Kölsjöån, 6.8. 1934. — Ovansjö, Storvik, Vallbyggeån, 30.7. 1938. — Österfärnebo, Grönsinka, bäcken från Fallsjön, 15.9. 1932. — Sterte kvarn, 15.9. 1932. — Gysinge, 14.7. 1936.

Hälsingland: Alfta, nära Flaxenåsen, 31.7. 1938. — Glitterån, 26.6. 1934. — Svabensverk, 26.6. 1934. — Bollnäs, Annefors, 27.6. 1934. — Delsbo, Storån, 21.6. 1936. — Färila, Kårböleskog, Stensjöbäcken, 1.8. 1938. — Skyte, 29.8. 1937. — Idenor, Delakvarn, 20.6. 1936. — Järvsö, Löräng, Milån, 17.8. 1938. — Ljusdal, 13.7. 1909, K (B, S, U). — Los, Dåasdammen, 29.9. 1937. — Nedre Lomsjöhed, 28.8. 1937. — Njutånger, Njöte, 20.6. 1936. — Norrala, Nårby, 20.6. 1936. — Ovanåker, Våsån, 31.7. 1938. — Skog, Hästhagen, 22.6. 1936. — Skogsbo, Långbo, 22.6. 1936. — Voxna, Överbo, bäcken från Brynässjöarna, 31.7. 1938. — Ytterhogdal, Västansjö, Jämnån, 2.8. 1938. — Överhogdal, Hoån nära Linköping, 2.8. 1938.

Härjedalen: Hede, Sätervallen, bäcken från Lunsjön, c. 540 m, 15.8. 1938. — Lillhärdal, nära Forsmon, 31.8. 1937. — Härjåbron, 30.8. 1937. — Storsjö, Rövran, 565 m, 3.8. 1938. — Sveg, Sålnan, 30.8. 1937. — Tännäs, bäck nära Ränndingsvallen, 760 m, 3.9. 1937.

Jämtland: Hällesjö, Gransjöån, 12.8. 1938. — Oviken, Stortjärnsbäcken, 495 m, 3.8. 1938.

Norrbotten: Edefors, Nedre Svartlå, b. fr. Degermyran, 14.8. 1940. — Hietaniemi, Pennikajoki, 26.7. 1940. — Karl Gustav, ån fr. Rutajärvi, 26.7. 1940. — Korpilombolo, n. Teurajärvi, Finnijoki, 29.7. 1940. — Nederkalix, Kamlungeforsen, 21.7. 1940. — Näsby, b. Ö byn, 22.7. 1940. — Nederluleå, Råneå—Börjelslandet, Norrmarkbäcken, 21.7. 1940. — Nedertorneå, Harrioja, 23.7. 1940. — Aavajoki, 23.7. 1940. — Översta delen av Kukkolankoski, 25.7. 1940. — Pajala, Liviöjoki, 31.7. 1940. — Köngäsenkoski, 31.7. 1940. — Areavaara—Kihlangi, Jalokoski, 1.8. 1940. — Kitkiöjärvi, Kitkiöjoki, 2.8. 1940. — Råneå, Råneälven, 21.7. 1940. — Övertorneå, bäck vid Kattilakoski, 28.7. 1940.

Lule Lappmark: Jokkmokk, Lagnäsån eft. vägen t. Kajkul, 16.8. 1940. — Koskats, Själlarim, b. — Kyrkbyn, b. fr. Skabramsjöarna, 18.8. 1940. — N. Klubbudden, b. fr. Seunnaksjöarna, 19.8. 1940.

Torne Lappmark: Jukkasjärvi, Kuosanen—Altajärvi, Siikajoki, 6.8. 1940. — Karesuando, Kelojoki, 3.8. 1940. — Myllyjoki, 3.8. 1940. — V grenen av Ainettijoki, 4.8. 1940. — Vittangi, Kulijoki, 5.8. 1940.

Tillägg (ej karterade):

Batrachospermum Crouanianum. Dalarna: Garpenberg, Dormsjö, 27.6. 1936. — *B. moniliforme.* Södermanland: Råbyrekane, Strömstugan, 25.7. 1888, K. Bohlin (B, L). — Uppland: Knivsta, Noor, 8,6, 1935. — Knutby, NV Gränsta, 4.7. 1942. — *B. virgatum.* Uppland: Knutby, NV Gränsta, 4.7. 1942. — *Pseudochantransia chalybaea.* Uppland: Knutby, NV Gränsta, 4.7. 1942. — *Sirodotia suecica.* Dalarna: Garpenberg, Dormsjö, 27.6. 1936.

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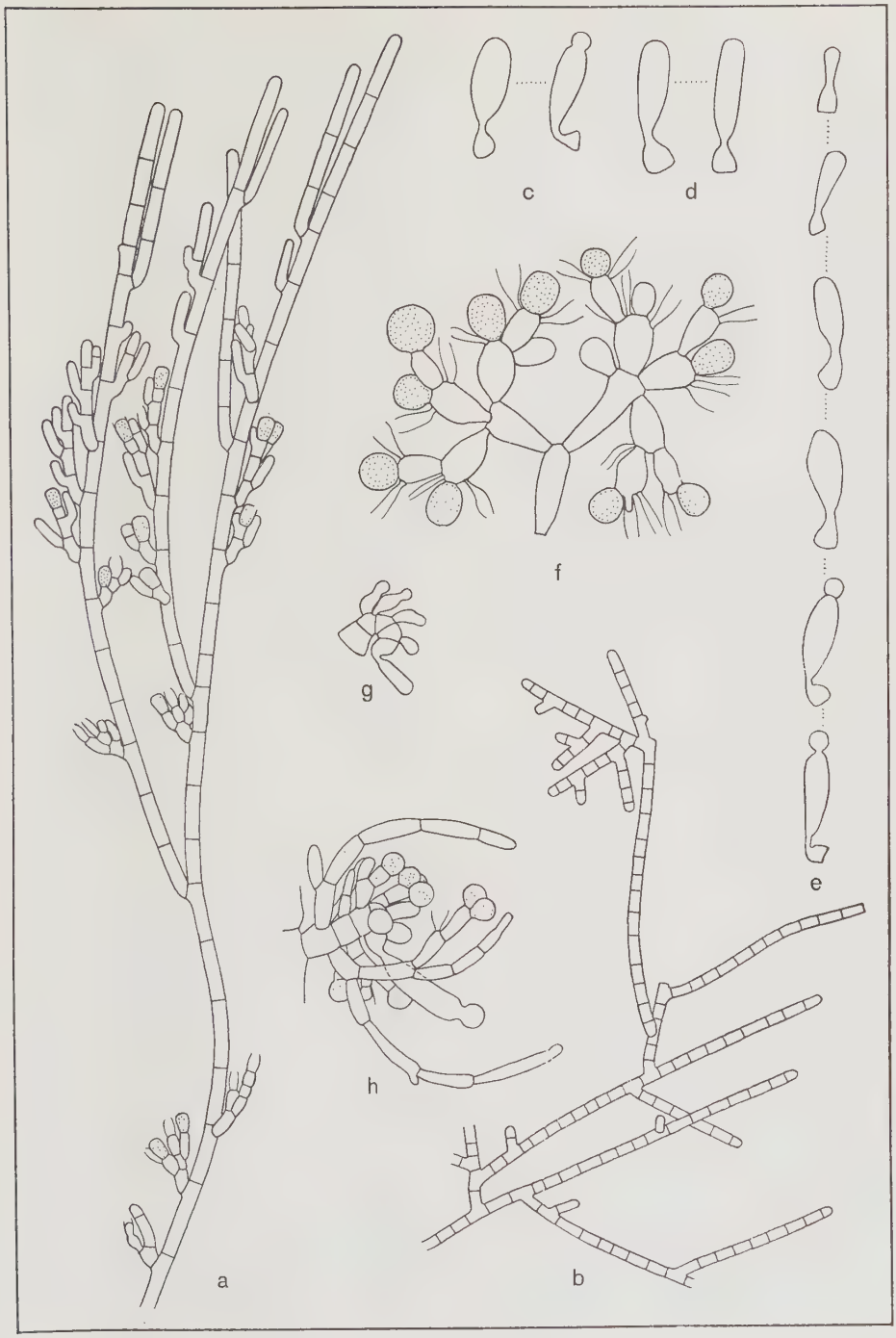
Explanation of Pl. I.

a. *Pseudochantransia Leibleinii,* upright branch with monosporangia, × 125 (Skåne: the river Segeån at Mölleberga).
b. *Ps. serpens,* branch, × 85 (Original material).
c—h. *Batrachospermum globosporum,* × 600.
c—e. Carpogonia at different stages of development. f. Gonimoblastic branch with carposporangia. g—h. Carpogonial branches of different ages; bractea frequently terminated by antheridia. (c. Gästrikland: Lake Mårdängssjön. d, f. Närke: Lake Vättern. e, g, h. Original material.)


a
b
c
d
e
f
g
h

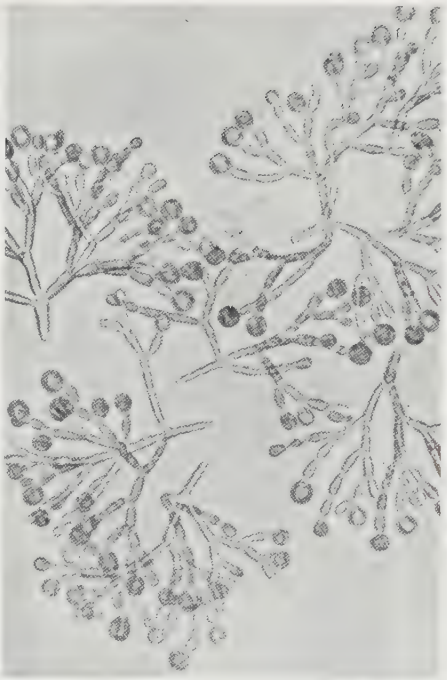
Explanation of Pl. II.

a. *Lemanea condensata,* dried specimens, × 1.3 (Original material).

b, d. *Batrachospermum globosporum,* × 300 (Original material).
b. Primary ramuli with antheridia: d. Gonimoblastic branches.

c. *B. Boryanum* var. *distensum,* primary ramuli with antheridia, × 300 (Småland: the river Lagan at Ljungby).

c



d

a

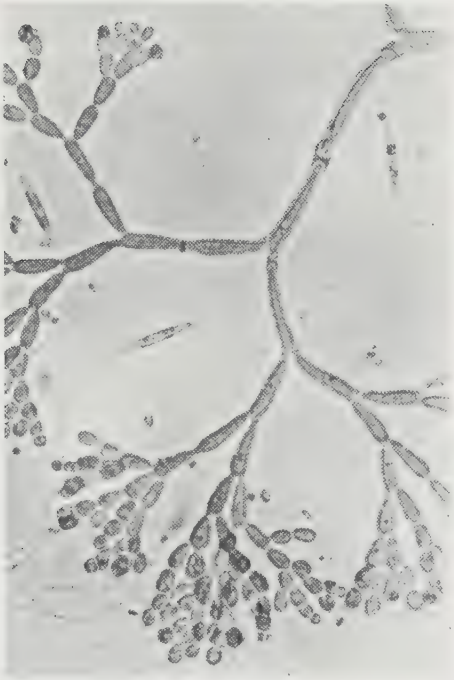
b

Explanation of Pl. III.

a. *Batrachospermum moniliforme*, primary ramuli.
b. *B. ectocarpum*, primary ramuli.
c. *B. Crouanianum*, primary ramuli with antheridia.
d. *B. Boryanum*, primary ramuli.
a—d. × 300 (Skåne: a brook near Klippan).

c

d

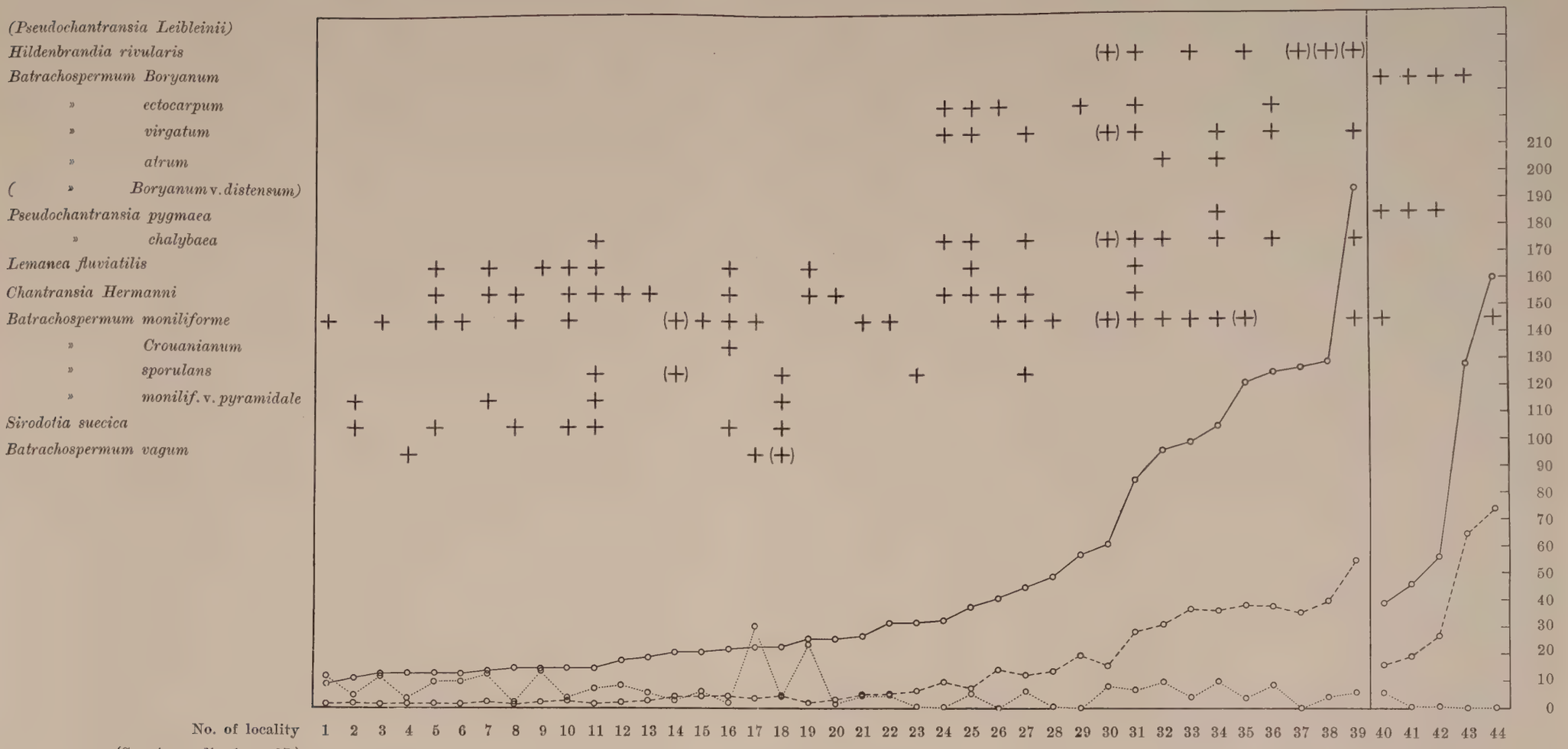


a

b

FLORIDEA-FLORA AND WATER-CHEMICAL DATA OF SOME SWEDISH WATER-COURSES.

Series L a **Series L b**



(See Appendix 1. p. 97.)

EXPLANATIONS.

\+ = occurrence in running water

(+) = » » stagnant » (lakes)

—○— = combustion residue as mg/l (average values)

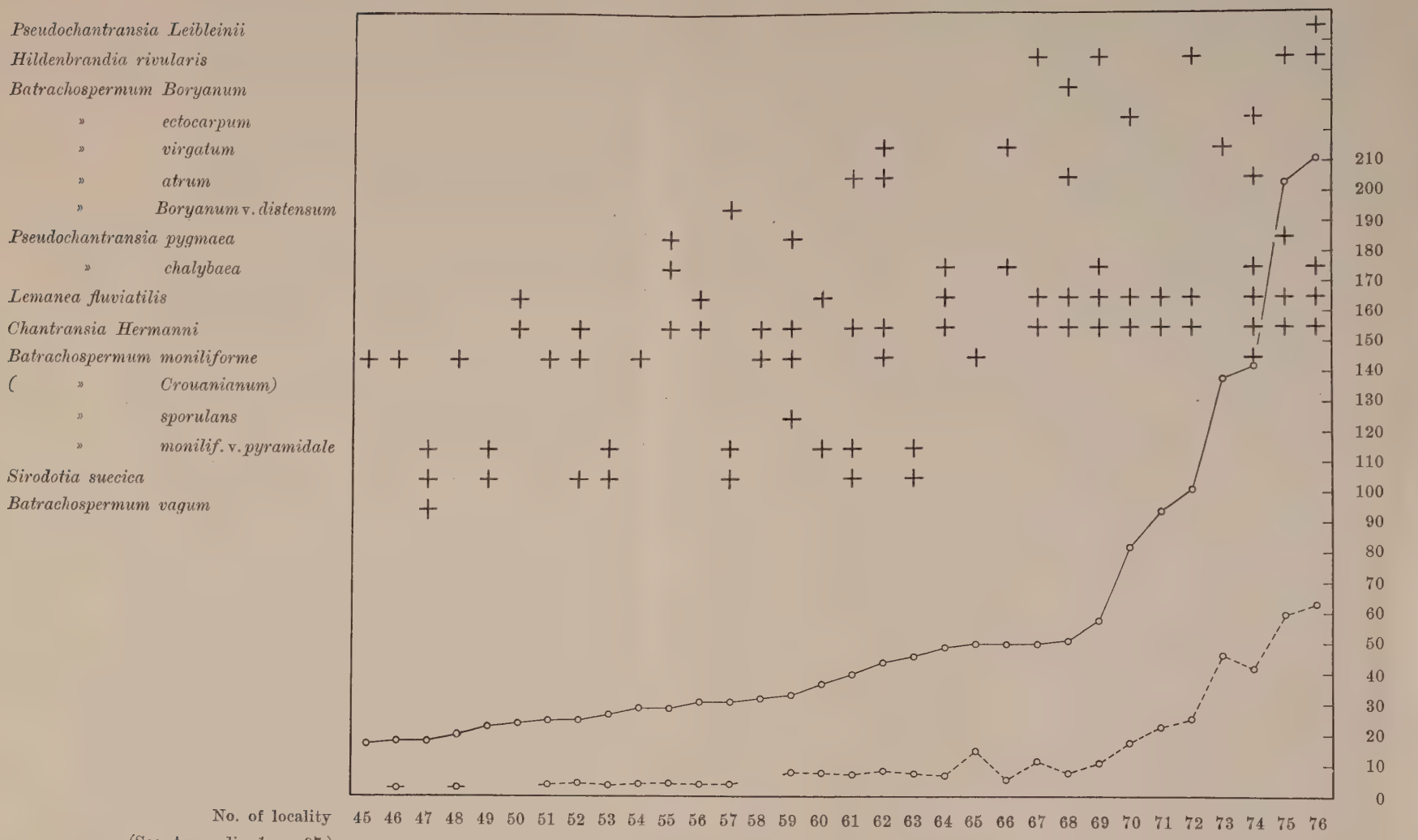
---○--- = Ca as mg/l (average values)

··· ○ ··· = Fe as mg/l . 10 (maximum values)

For further information and discussion see p. 63 et seq.

FLORIDEA-FLORA AND WATER-CHEMICAL DATA OF SOME SWEDISH WATER-COURSES.

Series E



(See Appendix 1. p. 97.)

EXPLANATIONS.

\+ = occurrence in running water

(+) = » » stagnant » lakes

—○— = combustion residue as mg/l (average values)

---○--- = Ca as mg/l (average values)

For further information and discussion see p. 63 et seq.

Corrigenda.

Page 12, line 26: *for* »stati» *read* »status».
» 14, » 9 from the bottom: *for* Rössjöholmsån *read* Bäljaneån.
» 19, » 23: *for* superflous *read* superficial.
» 21, » 19: *for* *Viridia* *read* *Setacea*.
» 24, » 12 from the bottom: *for* genus *read* section.
» 26, » 5 » » » : *for* 1930 *read* 1933 b.
» 27, » 13 » » » : *for* (1933) *read* (1933 b).
» 31, » 16 » » » : *for* (1933) *read* (1933 b).
» 33, » 12 » » » : *for* Antheridia *read* Monoecious antheridia.
» 39, » 14 » » » : *delete*, tab. 31 fig. 1—6.
» 44, » 13: *for* Tab. I e—g *read* Tab. I e—h.
» 47, » 14 from the bottom: *for* 1798 *read* 1778.
» 47, » 9 » » » : *for* ed. III, p. 597 (1798) *read* ed. II, p. 597 (1778).
» 54, » 3 » » » : *for* fig. 8 and 4 *read* fig. 8 and 6.
» 54, » 1 » » » : *for* south-western *read* north-western.
» 58, » 17: *for* *Ps.* *read* *Ch.*
» 59, » 12: *for* Filia *read* Fila.
» 66, » 11 from the bottom: *for* *Gallaei* *read* *atrum*.
» 71, » 20: *for* Fig. 3 *read* Fig. 2.
» 71, » 23: *for* 17 *read* 20.
» 73, » 11: *for* Fig. 19 *read* Fig. 17.
» 87, » 10 from the bottom: *for* moors *read* bogs.
» 91, » 18 » » » : *for* 1940 *read* 1939.
» 93, » 3: *for* 1933 *read* 1938.
» 104, lines 4—5 from the bottom: *read* N. Stålberg (1939, s. 48 s. n. *B. vagum* ssp. *flagelliforme*; U). — Hammar, i Vättern, 27.9. 1935, N. Stålberg (U).
» 114, line 3: *for* slurkhål *read* slukhål.
Appendix 2: Det på flera ställen förekommande sockennamnet Skogsbo (i Hälsingland) skall utbytas mot Skog.

Gunnar Israelson: The Freshwater Florideae of Sweden (Symbolae Botanicae Upsalienses VI: 1).

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